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New About the Balancing of Thermal Motors

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Abstract: The paper presents a new method of balancing the thermal motors, the method that perfectly fits the engines with modern internal combustion. This new constructive method imposes a new in-line engine design in order to better balance it, thus achieving a static balancing and total dynamics of the new type of internal combustion heat engine. The method can also be extended to external combustion thermal engines.

Keywords: Robots, Mechatronic Systems, Structure, Dynamics, Dynamics Systems, Machines, Engines, Thermal Engines, Engines Balancing

Introduction

This paper wants to complement an important aspect of internal combustion engines, as these engines are still working massively in global transport, and probably will do so for a long time, even if the electric motors slowly appeared multiplying the old Otto-type internal combustion engine or diesel.

If over the past 50 years, we witnessed a crisis of classical fossil fuels, due to increasing consumption, while petroleum reserves diminished by their eyes, today the expectations are quite different as the conditions and planetary resources have changed completely. Classic and fuel-powered games are today completely different from those in the last 50 years, precisely because of the discovery of new energy resources including fossil-powered planets.

The energy crisis that began in the 1970s and 1980s was completely overcome, initially through the construction of nuclear fission power plants, which at that time was a necessary evil because they stopped the global energy crisis that led to other social, economic crises ... We had in this way to restructure our energy resources, to switch the majority of public transport to electric motors, but to discover new energy sources. Today we can breathe easy because we already have more energy resources than needed, and huge reserves for the future, but still many other major prospects. Renewable energy resources, mostly solar and wind power, have now grown, resources that supply oil and natural gas, creating the possibility of storing oil reserves or even switching to 100% renewable energy systems in the future. In addition, new oil reserves have been discovered at the planetary level which has even led to the relaxation of this area. There have also been added new natural gas resources that can be used for the next 2,000 years in the future, given the fact that other energy resources will not be used, and even more so in the current conditions in which energy is already acquired mostly from wind, sun, water, and nuclear. We can say that we are well, very well, given the fact that the gas reserves of the planet have increased due to the exploitation of deep-shale gas, through modern extraction technologies. Today's gas can easily cover gas needs for at least two or even three thousand years at least, and not just because three large factories have already been built to convert gas into gasoline, diesel, kerosene or any type the desired oil fuel, and that in enormous quantities, and by multiplying in the future these special refineries will be able to obtain huge quantities of any kind of petroleum fuel only from the planetary shale gas reserves. We can sleep so we will have two or three thousand years of gas reserves, and any kind of oil fuel. Even though the number of vehicles has increased greatly and the specific consumption of fuel has decreased due to permanent refurbishment in this priority area.

A few years ago, a British company managed to get fossil fuels only from the atmosphere and energy, recovering the carbon products existing today in the air. Such a plant has not yet appeared because the technologies are too expensive and we already have fossil reserves at our discretion for several thousand years, given that we have been able to obtain most energy from water, sun, wind or nuclear.

Recently, a prestigious university in Switzerland managed to obtain superior fuels only from water and solar energy through simple, technologically simple processes that will only require a large amount of space allotted to produce continually high-quality kerosene from water and solar energy. So if there are still classical fuels, they can be re-infused just by the water and solar energy. We can now say that the games are already being made, especially as more and more electric motors have appeared on motor vehicles, some of them using hydrogen as a fuel, which in turn is a major energy resource on a massive scale, already massively implemented, and with great prospects for the future.

Under these new conditions, the necessity of continuing the studies on the thermal engines with the aim of their permanent improvement appears (Aabadi, 2019; Antonescu and Petrescu, 1985; 1989; Antonescu *et al*., 1985a; 1985b; 1986; 1987; 1988; 1994; 1997; 2000a; 2000b; 2001; Aversa *et al*., 2017a; 2017b; 2017c; 2017d; 2017e; 2016a; 2016b; 2016c; 2016d; 2016e; 2016f; 2016g; 2016h; 2016i; 2016j; 2016k; 2016l; 2016m; 2016n; 2016o; Cao *et al*., 2013; Dong *et al*., 2013; Comanescu, 2010; Franklin, 1930; He *et al*., 2013; Lee, 2013; Lin *et al*., 2013; Liu *et al*., 2013; Padula and Perdereau, 2013; Perumaal and Jawahar, 2013; Petrescu, 2011; 2015a; 2015b; Petrescu and Petrescu, 1995a; 1995b; 1997a; 1997b; 1997c; 2000a; 2000b; 2002a; 2002b; 2003; 2005a; 2005b; 2005c; 2005d; 2005e; 2011a; 2011b; 2012a; 2012b; 2013a; 2013b; 2013c; 2013d; 2013e; 2016a; 2016b; 2016c; Petrescu *et al*., 2009; 2016; 2017a; 2017b; 2017c; 2017d; 2017e; 2017f; 2017g; 2017h; 2017i; 2017j; 2017k; 2017l; 2017m; 2017n; 2017o; 2017p; 2017q; 2017r; 2017s; 2017t; 2017u; 2017v; 2017w; 2017x; 2017y; 2017z; 2017aa; 2017ab; 2017ac; 2017ad; 2017ae; 2018a; 2018b; 2018c; 2018d; 2018e; 2018f; 2018g; 2018h; 2018i; 2018j; 2018k; 2018l; 2018m; 2018n; Rulkov *et al*., 2016; Agarwala, 2016; Babayemi, 2016; Ben-Faress *et al*., 2019; Gusti and Semin, 2016; Mohamed *et al*., 2016; Wessels and Raad, 2016; Maraveas *et al*., 2015; Khalil, 2015; Rhode-Barbarigos *et al*., 2015; Takeuchi *et al*., 2015; Li *et al*., 2015; Vernardos and Gantes, 2015; Bourahla and Blakeborough, 2015; Stavridou *et al*., 2015; Ong *et al*., 2015; Dixit and Pal, 2015; Rajput *et al*., 2016; Rea and Ottaviano, 2016; Zurfi and Zhang, 2016 a-b; Zheng and Li, 2016; Buonomano *et al*., 2016a; 2016b; Faizal *et al*., 2016; Ascione *et al*., 2016; Elmeddahi *et al*., 2016; Calise *et al*., 2016; Morse *et al*., 2016; Abouobaida, 2016; Rohit and Dixit, 2016; Kazakov *et al*., 2016; Alwetaishi, 2016; Riccio *et al*., 2016a; 2016b; Iqbal, 2016; Hasan and El-Naas, 2016; Al-Hasan and Al-Ghamdi, 2016; Jiang *et al*., 2016; Sepúlveda, 2016; Martins *et al*., 2016; Pisello *et al*., 2016; Jarahi, 2016; Mondal *et al*., 2016; Mansour, 2016; Al Qadi *et al*., 2016b; Campo *et al*., 2016; Samantaray *et al*., 2016; Malomar *et al*., 2016; Rich and Badar, 2016; Hirun, 2016; Bucinell, 2016; Nabilou, 2016b; Barone *et al*., 2016; Bedon and Louter, 2016; Santos and Bedon, 2016; Fontánez *et al*., 2019; De León *et al*., 2019; Hypolite *et al*., 2019; Minghini *et al*., 2016; Bedon, 2016; Jafari *et al*., 2016; Orlando and Benvenuti, 2016; Wang and Yagi, 2016; Obaiys *et al*., 2016; Ahmed *et al*., 2016; Jauhari *et al*., 2016; Syahrullah and Sinaga, 2016; Shanmugam, 2016; Jaber and Bicker, 2016; Wang *et al*., 2016; Moubarek and Gharsallah, 2016; Amani, 2016; Shruti, 2016; Pérez-de León *et al*., 2016; Mohseni and Tsavdaridis, 2016; Abu-Lebdeh *et al*., 2016; Serebrennikov *et al*., 2016; Budak *et al*., 2016; Augustine *et al*., 2016; Jarahi and Seifilaleh, 2016; Nabilou, 2016a; You *et al*., 2016; AL Qadi *et al*., 2016a; Rama *et al*., 2016; Sallami *et al*., 2016; Huang *et al*., 2016; Ali *et al*., 2016; Kamble and Kumar, 2016; Saikia and Karak, 2016; Zeferino *et al*., 2016; Pravettoni *et al*., 2016; Bedon and Amadio, 2016; Mavukkandy *et al*., 2016; Yeargin *et al*., 2016; Madani and Dababneh, 2016; Alhasanat *et al*., 2016; Elliott *et al*., 2016; Suarez *et al*., 2016; Kuli *et al*., 2016; Waters *et al*., 2016; Montgomery *et al*., 2016; Lamarre *et al*., 2016; Daud *et al*., 2008; Taher *et al*., 2008; Zulkifli *et al*., 2008; Pourmahmoud, 2008; Pannirselvam *et al*., 2008; Ng *et al*., 2008; El-Tous, 2008; Akhesmeh *et al*., 2008; Nachiengtai *et al*., 2008; Moezi *et al*., 2008; Boucetta, 2008; Darabi *et al*., 2008; Semin and Bakar, 2008; Al-Abbas, 2009; Abdullah *et al*., 2009; Abu-Ein, 2009; Opafunso *et al*., 2009; Semin *et al*., 2009a; 2009b; 2009c; Zulkifli *et al*., 2009; Marzuki *et al*., 2015; Bier and Mostafavi, 2015; Momta *et al*., 2015; Farokhi and Gordini, 2015; Khalifa *et al*., 2015; Yang and Lin, 2015; Demetriou *et al*., 2015; Rajupillai *et al*., 2015; Sylvester *et al*., 2015; Ab-Rahman *et al*., 2009; Abdullah and Halim, 2009; Zotos and Costopoulos, 2009; Feraga *et al*., 2009; Bakar *et al*., 2009; Cardu *et al*., 2009; Bolonkin, 2009a; 2009b; Nandhakumar *et al*., 2009; Odeh *et al*., 2009; Lubis *et al*., 2009; Fathallah and Bakar, 2009; Marghany and Hashim, 2009; Kwon *et al*., 2010; Aly and Abuelnasr, 2010; Farahani *et al*., 2010; Ahmed *et al*., 2010; Kunanoppadon, 2010; Helmy and El-Taweel, 2010; Qutbodin, 2010; Pattanasethanon, 2010; Fen *et al*., 2011; Thongwan *et al*., 2011; Theansuwan and Triratanasirichai, 2011; Al Smadi, 2011; Tourab *et al*., 2011; Raptis *et al*., 2011; Momani *et al*., 2011; Ismail *et al*., 2011; Anizan *et al*., 2011; Tsolakis and Raptis, 2011; Abdullah *et al*., 2011; Kechiche *et al*., 2011; Ho *et al*., 2011; Rajbhandari *et al*., 2011; Aleksic and Lovric, 2011; Kaewnai and Wongwises, 2011; Idarwazeh, 2011; Ebrahim *et al*., 2012; Abdelkrim *et al*., 2012; Mohan *et al*., 2012; Abam *et al*., 2012; Hassan *et al*., 2012; Jalil and Sampe, 2013; Jaoude and El-Tawil, 2013; Ali and Shumaker, 2013; Zhao, 2013; El-Labban *et al*., 2013; Djalel *et al*., 2013; Nahas and Kozaitis, 2013; Petrescu and Petrescu, 2014a; 2014b; 2014c; 2014d; 2014e; 2014f; 2014g; 2014h; 2014i; 2015a; 2015b; 2015c; 2015d; 2015e; 2016a; 2016b; 2016c; 2016d; Fu *et al*., 2015; Al-Nasra *et al*., 2015; Amer *et al*., 2015; Sylvester *et al*., 2015b; Kumar *et al*., 2015; Gupta *et al*., 2015; Stavridou *et al*., 2015b; Casadei, 2015; Ge and Xu, 2015; Moretti, 2015; Wang *et al*., 2015; Petrescu *et al*., 2017 af-aj, 2018 o-v; Petrescu, 2015c, 2018 a-b; Petrescu and Petrescu, 2018 a-b).

Materials and Methods

In an internal combustion engine, about one-third of the total fuel power is converted into a useful machine.

Much of the energy is lost in the exhaust. In addition, another important part of the energy consumption is rejected as heating by the cooling system.

The importance of this study is to identify the key factors contributing to heat loss, which can nevertheless be used to minimize heat loss and at the same time improve the strength and efficiency of mechanical components. Loss of stored energy increases with increasing engine speed and engine load and therefore decreases the efficiency of mechanical components.

An important way to reduce the loss of thermal motors is to get a better balance.

In addition, a good balance to achieve silent and long-term operation without high wear, noise and vibration (Petrescu and Petrescu, 2014f; 2014g; 2014h; 2014i).

An important way to reduce the loss of thermal motors is to get a better balance.

On the other hand, the equal parts of the two forces do not give an impulse to produce a dynamic (partial) balance. Instead, only the parts of the two forces that are equal, but have opposite signs, with all that cancels the (static) forces, give a negative moment (load) which unbalanced (partially) dynamic engine.

The solution is taken to balance the overall dynamics of such an engine, doubling the engine (mirror) to get a 180-degree crank in a four-cylinder engine.

Balancing a line engine having a crank with a space of 180 [Deg]

Internal combustion engines (either in four-stroke engines or in two-stroke engines - Otto, Diesel, and Lenoir) are generally the most used engines.

Their balancing problem is extremely important for its smooth operation. There are two possible balancing types: Static and Dynamic.

Total static balancing determines the sum of the inertial forces of a mechanism to be zero. There is also a partial static balancing.

Balancing dynamics means the cancellation of all moments (loads) of the mechanism inertia.

One way to design an inline engine is one with a 180 ° space.

In this type of engine (regardless of their position, which is most often vertical) for two engine cylinders, they have a partial static imbalance (ie, there is a partial static balancing) and a dynamic imbalance.

Allow me to write the following calculation relationships (1):

$$\begin{cases} s_B = r\cdot\sin\phi_1 + l\cdot\sin\phi_2; \\ \ddot{s}_B = -r\cdot\sin\phi_1\cdot\omega_1^2 - l\cdot\sin\phi_2\cdot\omega_2^2 \\ F = F_B^i = -m_p\cdot\ddot{s}_B = \\ = m_p\cdot r\cdot\sin\phi_1\cdot\omega_1^2 + m_p\cdot l\cdot\sin\phi_2\cdot\omega_2^2 \\ \sin(\phi_1+\pi) = -\sin\phi_1;\ \sin\phi_{2'} = \sin\phi_2 \\ s_D = r\cdot\sin(\phi_1+\pi) + l\cdot\sin\phi_{2'} \\ \ddot{s}_D = -r\cdot\sin(\phi_1+\pi)\cdot\omega_1^2 - l\cdot\sin\phi_{2'}\cdot\omega_2^2 \\ = r\cdot\sin\phi_1\cdot\omega_1^2 - l\cdot\sin\phi_2\cdot\omega_2^2 \\ F_D^i = -m_p\cdot\ddot{s}_D \\ = -m_p\cdot r\cdot\sin\phi_1\cdot\omega_1^2 + m_p\cdot l\cdot\sin\phi_2\cdot\omega_2^2 \\ M^i = a\cdot m_p\cdot r\cdot\sin\phi_1\cdot\omega_1^2 \end{cases} \quad (1)$$

Figure 1 shows the kinematic scheme of such a mechanism (a two-cylinder in-line motor) having a lever of 180°.

Parts of force relations that are equal but have opposite signs cancel each other, producing a partial static equilibrium of the engine.

The other two parts of the force expressions that have the same sign are equal and do not cancel each other, but they come together, producing a static (partial) engine imbalance.

On the other hand, the equal parts of the two forces do not give an impulse to produce a dynamic (partially) engine.

Instead, only the parts of the two forces that are equal but have contradictory signs, although they cancel the (static) forces, give a negative moment (load) that dynamically disturbs the engine.

The solution adopted for a total dynamic equalization of such an engine is duplicating the engine (in a mirror) so as to obtain a 180° lever motor in the four-cylinder engine (Fig. 2).

Balancing a cranking engine with a space of 120 [Deg].

Another type of construction of the line engine is the engine with a space of 120°. In this type of engine (regardless of their position, most often vertical) for a three-cylinder engine, there is a partial static imbalance (ie there is a partial static balancing) and a dynamic imbalance.

Figure 3 shows the kinematic scheme of the mechanism of such an in-line three-cylinder engine, which has a crank with a gap of 120 [deg].

The first component of the force F_B^i is canceled by the first component of the other two forces F_D^i and F_F^i and therefore it produces a static balance (partial), but these first components give a dynamic moment, so we have a dynamic imbalance.

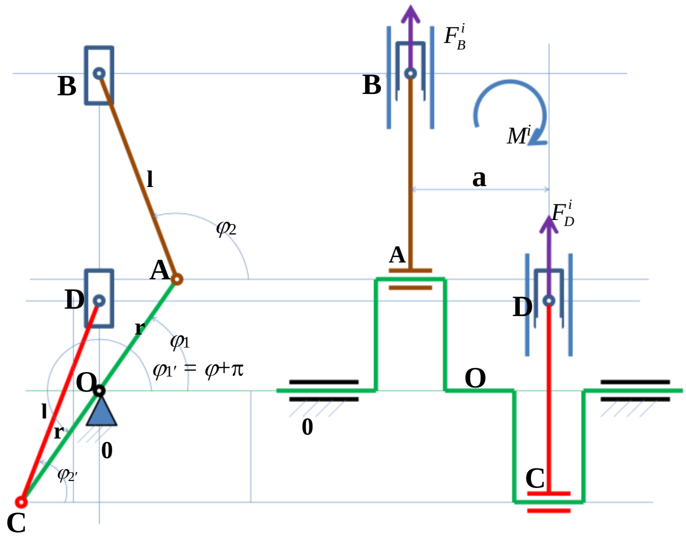

Fig. 1: Kinematic diagram of an vertical engine with two cylinders in line, which has a crank with a gap of 180 [deg]

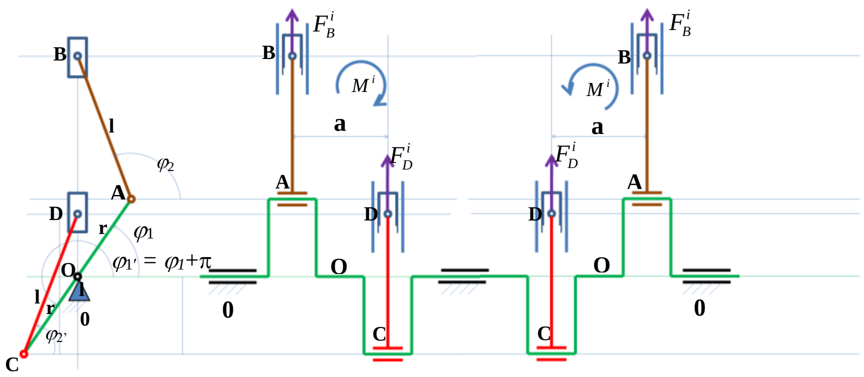

Fig. 2: Kinematic diagram of an vertical engine with four cylinders in line, which has a crank having a gap of 180 [deg]

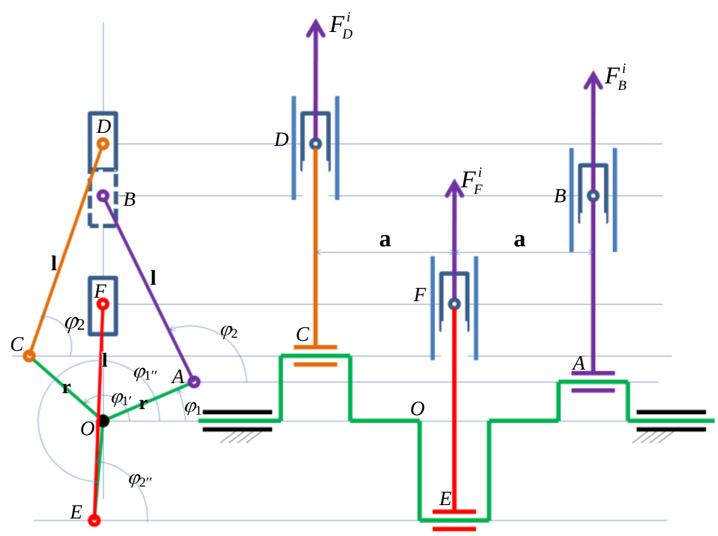

Fig. 3: Kinematic diagram of an vertical engine with three cylinders in line, which has a crank with a gap of 120

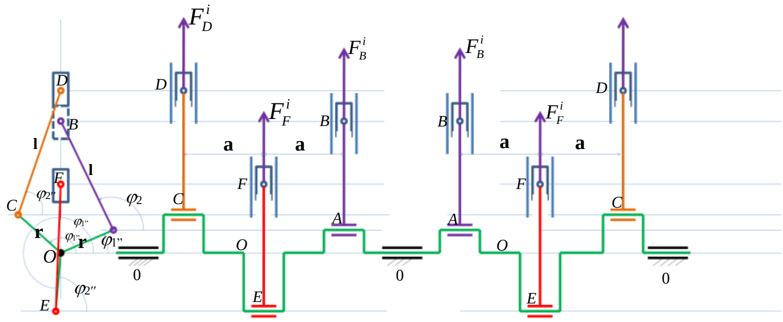

Fig. 4: Kinematic diagram of an vertical engine with six cylinders in line, which has a crank with a gap of 120 [deg]

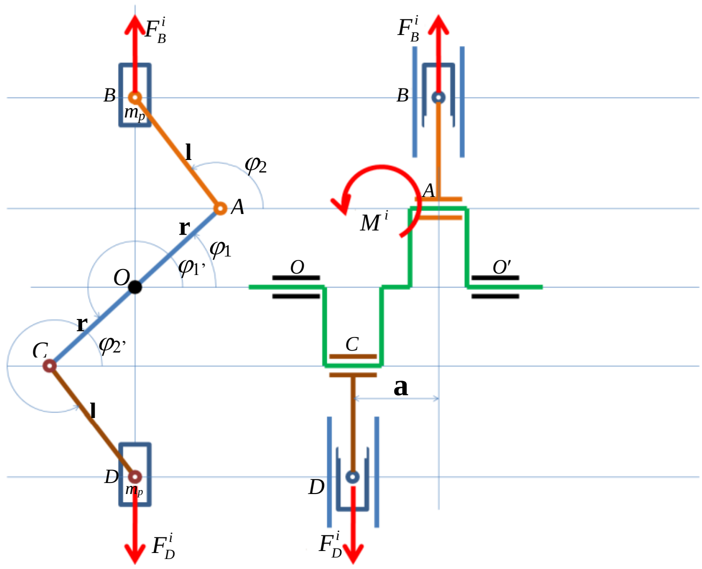

Fig. 5: Kinematic diagram of an engine in line with two opposed cylinders (boxers)

A second component of the force F_D^i is equal and opposite sign of the second component of the force F_F^i, they canceling each other and thus generating a static balancing (partial) additional, but additionally producing a dynamic moment, creating an imbalance additional dynamic. The second component of force F_B^i is added to the third component of the other two forces F_D^i and F_F^i. They produce a static imbalance and gives and a dynamic moment at the same time producing a dynamic imbalance. Adopting an engine solution doubled symmetrically in a mirror (a six-cylinder engine in line with a phase shift of the cranks from 120 [deg]), we achieved an overall dynamic balance (cancellation of all moments given of inertia forces) and a static balance (partial) of two-thirds of the total inertial forces, a balancing which is however superior than of the in-line engines with a phase shift of the cranks from 180 [deg] (Fig. 4).

Shall write following relations of calculation (2):

$$\begin{cases} s_B = r\cdot\sin\phi_1 + l\cdot\sin\phi_2; \\ \ddot{s}_B = -r\cdot\sin\phi_1\cdot\omega_1^2 - l\cdot\sin\phi_2\cdot\omega_2^2 \\ F = F_B^i = -m_p\cdot\ddot{s}_B = m_p\cdot r\cdot\sin\phi_1\cdot\omega_1^2 + m_p\cdot l\cdot\sin\phi_2\cdot\omega_2^2 \\ s_D = r\cdot\sin\left(\phi_1 + \frac{2\pi}{3}\right) + l\cdot\sin\phi_{2'} \\ \ddot{s}_D = -r\cdot\sin\left(\phi_1 + \frac{2\pi}{3}\right)\cdot\omega_1^2 - l\cdot\sin\phi_{2'}\cdot\omega_2^2 = 0.5\cdot r\cdot \\ \sin\phi_1\cdot\omega_1^2 - 0.866\cdot r\cdot\cos\phi_1\cdot\omega_1^2 - l\cdot\sin\phi_{2'}\cdot\omega_2^2 \\ F_D^i = -m_p\cdot\ddot{s}_D = -0.5\cdot m_p\cdot r\cdot\sin\phi_1\cdot\omega_1^2 \\ +0.866\cdot m_p\cdot r\cdot\cos\phi_1\cdot\omega_1^2 + m_p\cdot l\cdot\sin\phi_{2'}\cdot\omega_2^2 \\ s_F = r\cdot\sin\left(\phi_1 - \frac{2\pi}{3}\right) + l\cdot\sin\phi_{2''} \\ \ddot{s}_F = -r\cdot\sin\left(\phi_1 - \frac{2\pi}{3}\right)\cdot\omega_1^2 - l\cdot\sin\phi_{2''}\cdot\omega_2^2 \\ = 0.5\cdot r\cdot\sin\phi_1\cdot\omega_1^2 + 0.866\cdot r\cdot\cos\phi_1\cdot\omega_1^2 - l\cdot\sin\phi_{2''}\cdot\omega_2^2 \\ F_F^i = -m_p\cdot\ddot{s}_F = -0.5\cdot m_p\cdot r\cdot\sin\phi_1\cdot\omega_1^2 \\ -0.866\cdot m_p\cdot r\cdot\cos\phi_1\cdot\omega_1^2 + m_p\cdot l\cdot\sin\phi_{2''}\cdot\omega_2^2 \end{cases} \quad (2)$$

Remarks: Similarly constructed inline engines with more cylinders, having to crank ever smaller gaps, are obtained by doubling the number of cylinders in the mirror, linear motors with a total dynamic balanced and a partial static balanced that can becoming better. Thus, to an in-line five-cylinder engine with the gap between cranks of 720/5=72 [deg], one obtains a superior partial static balance and by doubling the engine symmetrically mirrored by making a linear motor with ten cylinders, one obtains a superior partial static balance and an overall dynamic balance.

Thus, constructive and technological requirements are becoming more and more difficult. V motors cannot achieve any static balancing, but not a general dynamics. To improve the dynamics of these higher efficiency motors, see the dynamic and kinematic conditions of the constructive choice of the alpha angle. The most complete solution for balancing the internal combustion engine is considered to be one with the boxer. For the two opposite cylinders, a complete static balancing (inertial forces) and symmetrical doubling in a mirror of the number of cylinders for a four-cylinder engine that resists two or two moments of the total, inertial dynamic force).

Balancing an engine (inline) with opposite cylinders (boxers).

Another type of engine construction is the cylindrical engine in line, called the "boxer" of the cylinders. In this type of engine (regardless of their position, most often vertical) for the two-cylinder engine, there is a total static balancing and a dynamic imbalance. Allow me to write the following calculation relationships (3):

$$\begin{cases} s_B = r\cdot\sin\phi_1 + l\cdot\sin\phi_2; \\ \ddot{s}_B = -r\cdot\sin\phi_1\cdot\omega_1^2 - l\cdot\sin\phi_2\cdot\omega_2^2 \\ F = F_B^i = -m_p\cdot\ddot{s}_B = m_p\cdot r\cdot\sin\phi_1\cdot\omega_1^2 + m_p\cdot l\cdot\sin\phi_2\cdot\omega_2^2 \\ \sin(\phi_1+\pi) = -\sin\phi_1; \\ \sin(\phi_2+\pi) = -\sin\phi_2 \\ s_D = r\cdot\sin(\phi_1+\pi) + l\cdot\sin(\phi_2+\pi) \\ \ddot{s}_D = -r\cdot\sin(\phi_1+\pi)\cdot\omega_1^2 - l\cdot\sin(\phi_2+\pi)\cdot\omega_2^2 \\ = r\cdot\sin\phi_1\cdot\omega_1^2 + l\cdot\sin\phi_2\cdot\omega_2^2 = -\ddot{s}_B \\ F_D^i = -m_p\cdot\ddot{s}_D = m_p\cdot\ddot{s}_B = -F_B^i = -F \\ = -m_p\cdot r\cdot\sin\phi_1\cdot\omega_1^2 - m_p\cdot l\cdot\sin\phi_2\cdot\omega_2^2 \\ F_D^i + F_B^i = 0 \; dar \; M^i \neq 0 \\ M^i = a\cdot F_B^i = -a\cdot m_p\cdot\ddot{s}_B \Rightarrow \\ \Rightarrow M^i = a\cdot m_p\cdot r\cdot\sin\phi_1\cdot\omega_1^2 + a\cdot m_p\cdot l\cdot\sin\phi_2\cdot\omega_2^2 \\ \text{At the Engine doubled in a mirror} \\ \sum F^i = 0 \\ \sum M^i = 0 \end{cases} \quad (3)$$

Figure 5 shows the kinematic scheme of the mechanism of such a motor (with two opposite cylinders in line) (boxers), (Petrescu and Petrescu, 2014f; 2014g; 2014h; 2014i).

This two-cylinder boxer engine is statically balanced (the sum of the inertial forces must be canceled).

It is only unbalanced dynamic (it has an inertial point different from zero), but it can be dynamically balanced by adding two more cylinders (by symmetry in a mirror) boxers (Fig. 6).

Although it seems to have a larger gauge, though only in four cylinders (two opposite pairs), this type of internal combustion engine heat is almost totally balanced both statically and dynamically. The first engineer to patented a boxer engine was Karl Benz, who presented such a patent of a boxer engine (Fig. 7) in 1896.

In 1923, Max Friz designed and built a BMW 500 cc boxer engine, which is still produced and used today due to its power, low consumption and, in particular, its static and dynamic balancing. German German German German, German Citroen, Chevrolet GM Division (American Louis Louis Chevrolet Division, May 30, 1911) and William Durant, owner of Buick General Motors, German German German division VW.

Another static and dynamic balancing engine, such as Boxer, is the internal combustion engine with the opposite piston (Fig. 8).

Balancing the Rotating Mass

Another type of balancing is that of rotating masses.

The motors (of the thermal motors) are balanced by this model.

It is believed that several masses (concentrates) are attached to a rotary shaft.

The weights are rotated together with the shaft. These may be punctual masses, spheres, etc., however, certain spheres (each of which have mass-centered concentration at the center of gravity) will be considered, as shown in Fig. 9.

The weights are attached to the axis of rotation by different supports, but will only consider the distance theory in the center of each sphere on the axis of the shaft. The perpendicular points passing from the center of each sphere to the axis of the shaft are marked with 1, 2, 3, ... and ... n.

Through these legs, we pulled parallel lines to the x-axis, from which are measured the angles between distances and the horizontal axes. Is measured and the distances of these points measured on the axis of rotation from the origin O of the Cartesian system xOyz (see Fig. 9). Shall be written the amounts moments generated by the forces of inertia of the concentrated masses in relation to the axis Ox, Oy, O'x' and O'y' (system 4). Solve system (4) is carried out with the formulae given by the system (5).

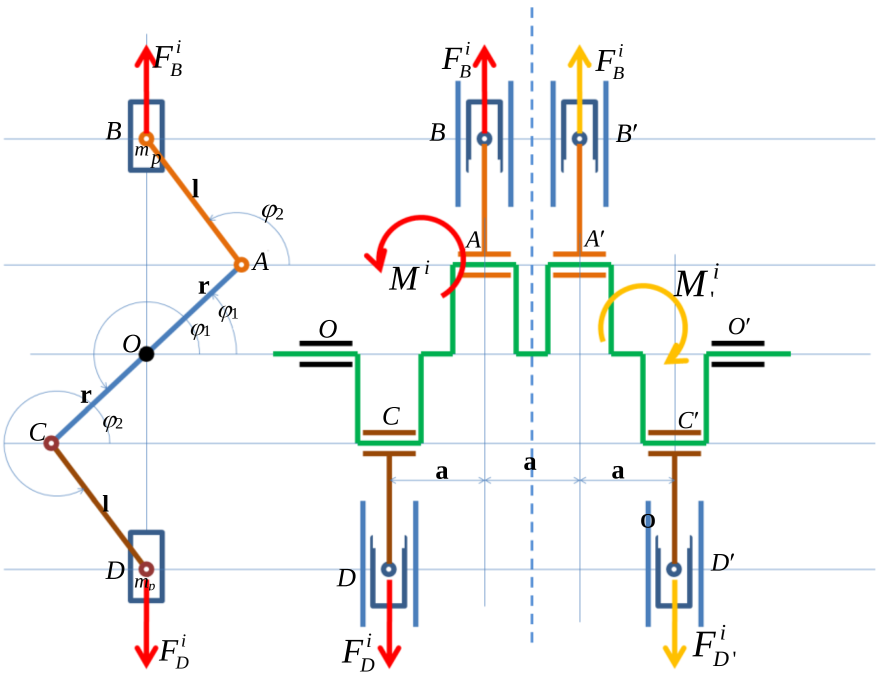

Fig. 6: Kinematic diagram of an engine in line with four opposed cylinders (boxers)

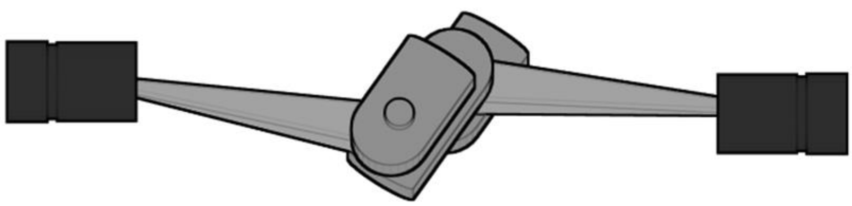

Fig. 7: First boxer engine, patented by Karl Benz

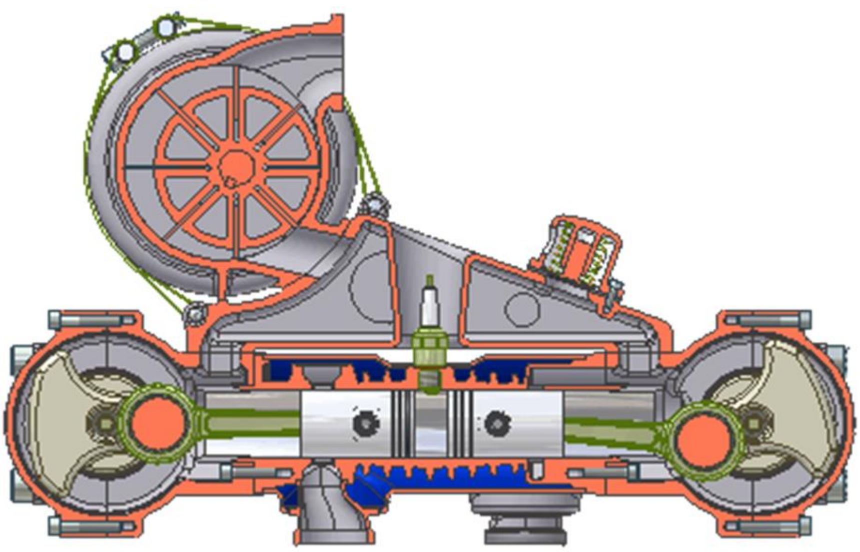

Fig. 8: Kinematic diagram of an engine in line with opposed pistons

Similar to the model of masses concentrated in rotary motion are solved and the balancing of the rotating shafts (Petrescu and Petrescu, 2014f; 2014g; 2014h; 2014i).

$$\begin{cases}\sum_{j=1}^{n}\left(F_j^i\cdot b_j\cdot\sin\phi_j\right)\\+F_{II}^i\cdot b\cdot\sin\phi_{II}=0\\\sum_{j=1}^{n}\left(F_j^i\cdot b_j\cdot\cos\phi_j\right)\\+F_{II}^i\cdot b\cdot\cos\phi_{II}=0\\\sum_{j=1}^{n}\left[F_j^i\cdot\left(b-b_j\right)\cdot\sin\phi_j\right]\\+F_I^i\cdot b\cdot\sin\phi_I=0\\\sum_{j=1}^{n}\left[F_j^i\cdot\left(b-b_j\right)\cdot\cos\phi_j\right]\\+F_I^i\cdot b\cdot\cos\phi_I=0\end{cases}\quad(4)$$

$$\begin{cases}F_I^i=\frac{1}{b}\cdot\sqrt{\left\{\sum_{j=1}^{n}\left[F_j^i\left(b-b_j\right)\sin\phi_j\right]\right\}^2+\left\{\sum_{j=1}^{n}\left[F_j^i\left(b-b_j\right)\cos\phi_j\right]\right\}^2}\\F_{II}^i=\frac{1}{b}\cdot\sqrt{\left[\sum_{j=1}^{n}\left(F_j^i\cdot b_j\cdot\sin\phi_j\right)\right]^2+\left[\sum_{j=1}^{n}\left(F_j^i\cdot b_j\cdot\cos\phi_j\right)\right]^2}\\\sin\phi_I=-\frac{\sum_{j=1}^{n}\left[F_j^i\cdot\left(b-b_j\right)\cdot\sin\phi_j\right]}{F_I^i\cdot b};\\\cos\phi_I=-\frac{\sum_{j=1}^{n}\left[F_j^i\cdot\left(b-b_j\right)\cdot\cos\phi_j\right]}{F_I^i\cdot b}\end{cases}$$

$$\begin{cases}\phi_I=semn\left(\sin\phi_I\right)\cdot\arccos\left(\cos\phi_I\right)\\\sin\phi_{II}=-\frac{\sum_{j=1}^{n}\left(F_j^i\cdot b_j\cdot\sin\phi_j\right)}{F_{II}^i\cdot b};\\\cos\phi_{II}=-\frac{\sum_{j=1}^{n}\left(F_j^i\cdot b_j\cdot\cos\phi_j\right)}{F_{II}^i\cdot b}\\\phi_{II}=semn\left(\sin\phi_{II}\right)\cdot\arccos\left(\cos\phi_{II}\right)\end{cases}\quad(5)$$

Result and Discussion

Starting with the engine main mechanism in the compressor system (when the motor mechanism is acting from the crank; see the Fig. 10).

The forces of the mechanism can be seen in Fig. 11.

In the diagram below (Fig. 12) we compare this new torque with the classic.

The new torque was determined considering the variation of velocities with forces and forces variation due to velocities (system 6).

In order to achieve an optimum and thus have the maximum possible balance of the moments, which would facilitate the optimal operation of the engine at maximum capacity only with reduced moments and powers, so with reduced fuel consumption and low NOx, it is necessary to pass to a new constructive schema of the internal combustion engine (Fig. 13).

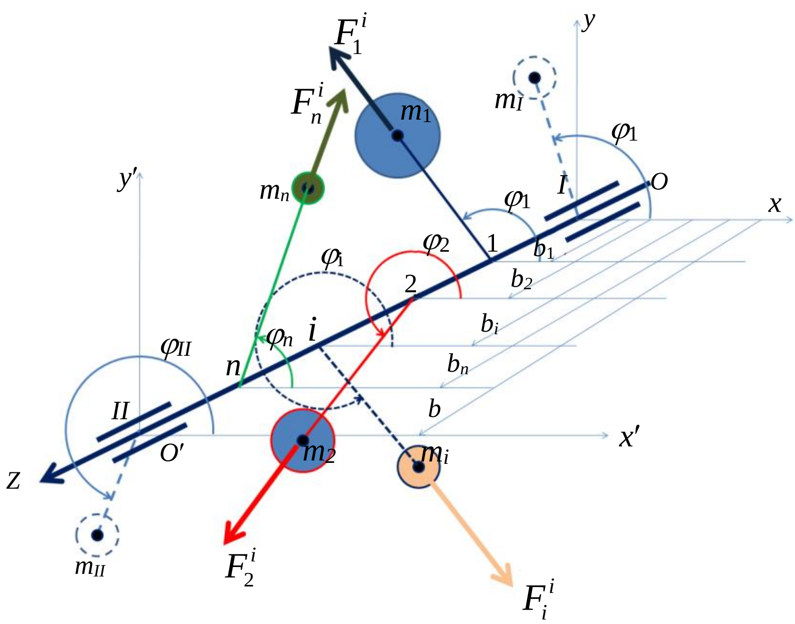

Fig. 9: Balancing of the rotating concentrated masses

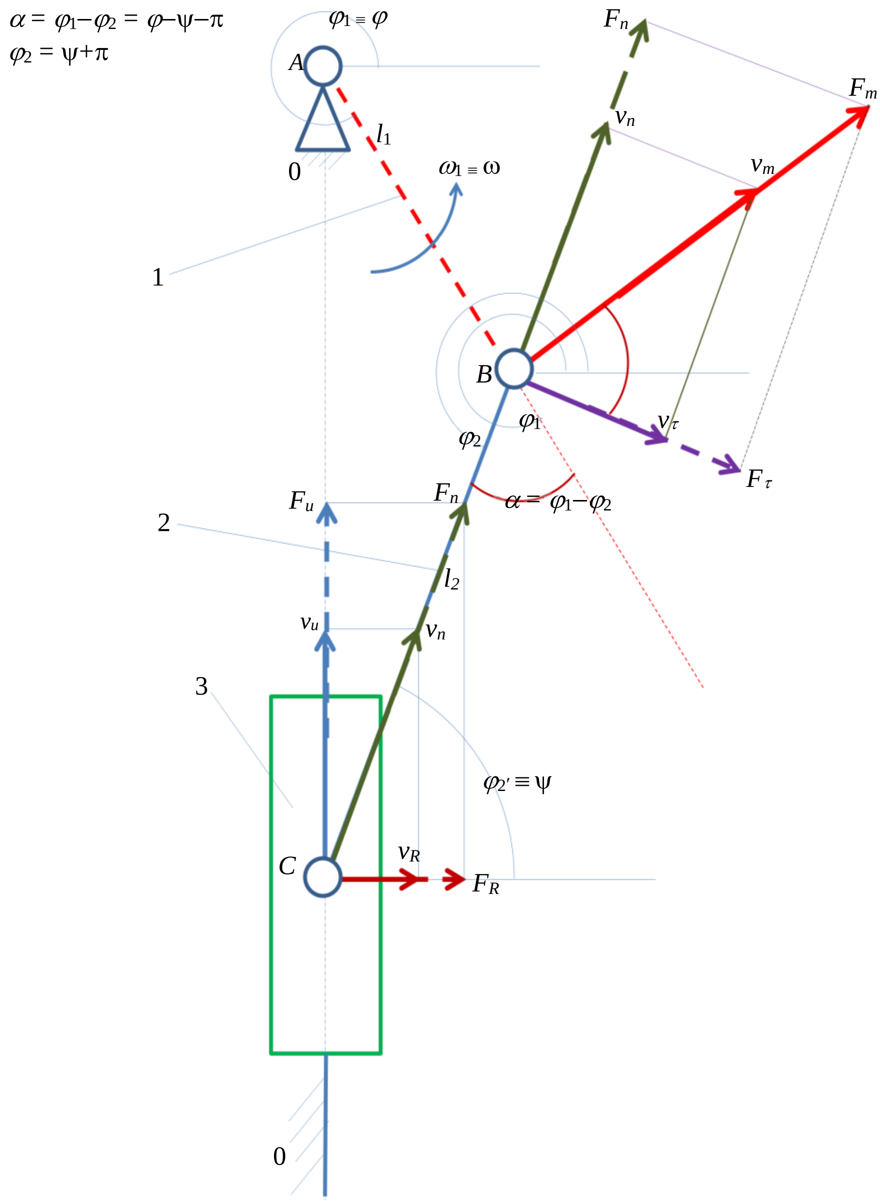

Fig. 10: The distribution of the forces and velocities in engine mechanism, when it is operated of the crank (element 1)

So the new engine will work with moments and low power just like a modern dynamic engine that needs very high powers and moments, plus the proposed engine will be very well balanced statically, ie from the point of view of the inertial forces (Fig. 13). If a total dynamic equilibrium (and balancing momentum of inertial forces) is desired, it will move to the kinematic scheme of Figure 14, where the proposed new engine doubles into the mirror (Petrescu and Petrescu, 2014f; 2014g; 2014h; 2014i):

$$\begin{cases} \sum P = 0 \Rightarrow F_m \cdot l_1 \cdot \omega_1 + M_2^i \cdot \omega_2 + F_{G_2}^{ix} \cdot \dot{x}_{G_2} + \\ + F_{G_2}^{iy} \cdot \dot{y}_{G_2} + F_{G_3}^{iy} \cdot \dot{y}_{G_3} + F_R \cdot \dot{y}_C = 0; \quad F_u = -F_R \Rightarrow \\ \begin{cases} F_u = \dfrac{F_m \cdot l_1 \cdot \omega_1 + M_2^i \cdot \omega_2 + F_{G_2}^{ix} \cdot \dot{x}_{G_2} + F_{G_2}^{iy} \cdot \dot{y}_{G_2} + F_C^{iy} \cdot \dot{y}_C}{\dot{y}_C} \\ F_u = F_m \cdot \sin\psi \cdot \sin(\psi - \phi) \end{cases} \\ \Rightarrow F_m = \dfrac{F_C^{iy} \cdot \dot{y}_C + M_2^i \cdot \omega_2 + F_{G_2}^{ix} \cdot \dot{x}_{G_2} + F_{G_2}^{iy} \cdot \dot{y}_{G_2}}{\dot{y}_C \cdot \sin\psi \cdot \sin(\psi - \phi) - l_1 \cdot \omega_1} \\ M_m = F_m \cdot l_1 \end{cases} \quad (6)$$

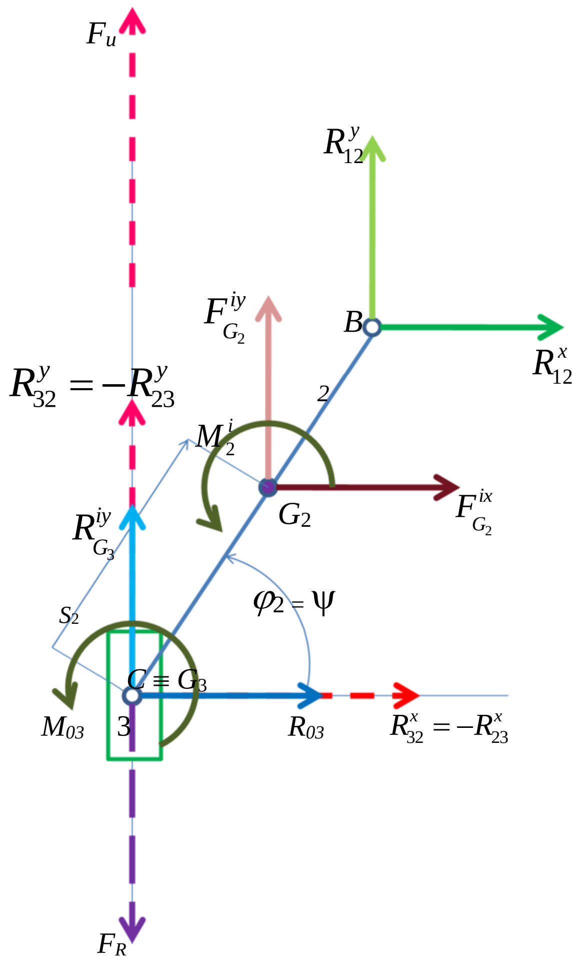

Fig. 11: The forces of mechanism, when it is operated from the crank (element 1)

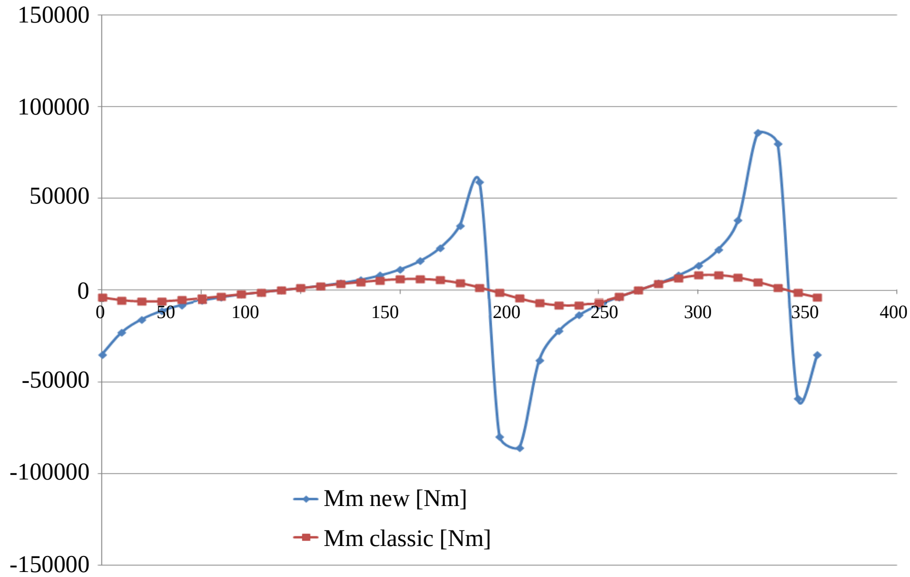

Fig. 12: The classical torque and the new torque

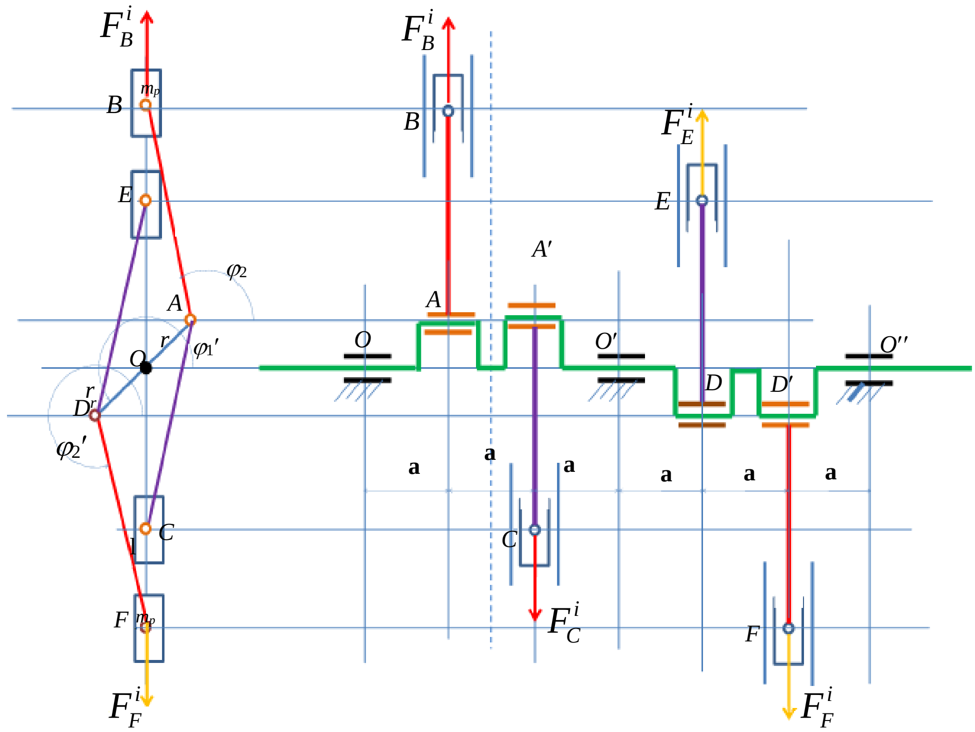

Fig. 13: Balancing of one original internal combustion engine four-cylinder in line

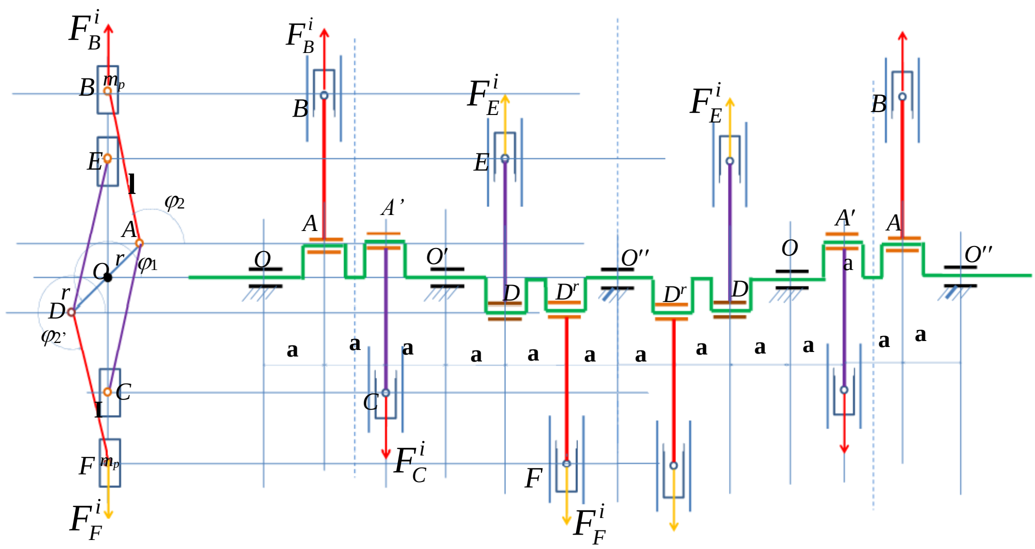

Fig. 14: Balancing of one original internal combustion engine eight-cylinder in line

Conclusion

Today we have a fleet of over one billion vehicles with internal combustion engines such as Otto or diesel, a park that grows every year with another 70-80 million cars, infernal rhythm we could say and all are sold and registered always coming into circulation, because the planet is constantly increasing its population and its claims to a better life. The problem of fossil fuels and energy has already been solved on a planetary scale, bringing great relief to the entire planet, but the issue of crowding the population on the blue planet has not yet been solved, which is why the permanent improvement of their vehicles and their engines may also it brings many planetary benefits, even if planetary agglomeration will not be solved by this way, but life will still be easier.

A few years ago, a British company managed to get fossil fuels only from the atmosphere and energy, recovering the carbon products existing today in the air. Such a plant has not yet appeared because the technologies are too expensive and we already have fossil reserves at our discretion for several thousand years, given that we have been able to obtain most energy from water, sun, wind or nuclear.

Recently, a prestigious university in Switzerland managed to obtain superior fuels only from water and solar energy through simple, technologically simple processes that will only require a large amount of space allotted to produce continually high-quality kerosene from water and solar energy. So if there are still classical fuels, they can be re-infused just by the water and solar energy. We can now say that the games are already being made, especially as more and more electric motors have appeared on motor vehicles, some of them using hydrogen as a fuel, which in turn is a major energy resource on a massive scale, already massively implemented, and with great prospects for the future.

Under these new conditions, the necessity of continuing the studies on the thermal engines with the aim of their permanent improvement appears.

In order to achieve an optimum and thus have the maximum possible balance of the moments, which would facilitate the optimal operation of the engine at maximum capacity only with reduced moments and powers, so with reduced fuel consumption and low NOx, it is necessary to pass to a new constructive schema of the internal combustion engine (Fig. 13). So the new engine will work with moments and low power just like a modern dynamic engine that needs very high powers and moments, plus the proposed engine will be very well balanced statically, ie from the point of view of the inertial forces (Fig. 13). If a total dynamic equilibrium (and balancing momentum of inertial forces) is desired, it will move to the kinematic scheme of Figure 14, where the proposed new engine doubles into the mirror.

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Author’s Contributions

All the authors contributed equally to prepare, develop and carry out this manuscript.

Ethics

This article is original and contains unpublished material. Authors declare that are not ethical issues and no conflict of interest that may arise after the publication of this manuscript.

References

Aabadi, MM.L., 2019. Dynamic Reliability analysis of steel moment frames using monte carlo technique. Am. J. Eng. Applied Sci., 12: 204-213. DOI: 10.3844/ajeassp.2019.204.213

Ab-Rahman, M.S., H. Guna, MH. Harun, SD. Zan and K. Jumari, 2009. Cost-effective fabrication of self-made 1×12 polymer optical fiber-based optical splitters for automotive application. Am. J. Eng. Applied Sci., 2: 252-259. DOI: 10.3844/ajeassp.2009.252.259

Abam, F.I., I.U. Ugot and D.I. Igbong, 2012. Performance analysis and components irreversibilities of a (25 MW) gas turbine power plant modeled with a spray cooler. Am. J. Eng. Applied Sci., 5: 35-41. DOI: 10.3844/ajeassp.2012.35.41

Abdelkrim, H., S.B. Othman, A.K.B. Salem and S.B. Saoud, 2012. Dynamic partial reconfiguration contribution on system on programmable chip architecture for motor drive implementation. Am. J. Eng. Applied Sci., 5: 15-24. DOI: 10.3844/ajeassp.2012.15.24

Abdullah, M.Z., A. Saat and Z. Hamzah, 2011. Optimization of energy dispersive x-ray fluorescence spectrometer to analyze heavy metals in moss samples. Am. J. Eng. Applied Sci., 4: 355-362. DOI: 10.3844/ajeassp.2011.355.362

Abdullah, M., A. F.M. Zain, Y. H. Ho and S. Abdullah, 2009. TEC and scintillation study of equatorial ionosphere: A month campaign over sipitang and parit raja stations, Malaysia. Am. J. Eng. Applied Sci., 2: 44-49. DOI: 10.3844/ajeassp.2009.44.49

Abdullah, H. and S.A. Halim, 2009. Electrical and magnetoresistive studies Nd doped on La-Ba-Mn-O_3 manganites for low-field sensor application. Am. J. Eng. Applied Sci., 2: 297-303. DOI: 10.3844/ajeassp.2009.297.303

Abouobaida, H., 2016. Robust and efficient controller to design a standalone source supplied DC and AC load powered by photovoltaic generator. Am. J. Eng. Applied Sci., 9: 894-901. DOI: 10.3844/ajeassp.2016.894.901

Abu-Ein, S., 2009. Numerical and analytical study of exhaust gases flow in porous media with applications to diesel particulate filters. Am. J. Eng. Applied Sci., 2: 70-75. DOI: 10.3844/ajeassp.2009.70.75

Abu-Lebdeh, M., G. Pérez-de León, S.A. Hamoush, R.D. Seals and V.E. Lamberti, 2016. Gas atomization of molten metal: Part II. Applications. Am. J. Eng. Applied Sci., 9: 334-349. DOI: 10.3844/ajeassp.2016.334.349

Agarwala, S., 2016. A perspective on 3D bioprinting technology: Present and future. Am. J. Eng. Applied Sci., 9: 985-990. DOI: 10.3844/ajeassp.2016.985.990

Ahmed, M., R. Khan, M. Billah and S. Farhana, 2010. A novel navigation algorithm for hexagonal hexapod robot. Am. J. Eng. Applied Sci., 3: 320-327. DOI: 10.3844/ajeassp.2010.320.327

Ahmed, M.K., H. Haque and H. Rahman, 2016. An approach to develop a dynamic job shop scheduling by fuzzy rule-based system and comparative study with the traditional priority rules. Am. J. Eng. Applied Sci., 9: 202-212. DOI: 10.3844/ajeassp.2016.202.212

Akhesmeh, S., N. Pourmahmoud and H. Sedgi, 2008. Numerical study of the temperature separation in the ranque-hilsch vortex tube. Am. J. Eng. Applied Sci., 1: 181-187. DOI: 10.3844/ajeassp.2008.181.187

Al-Abbas, I.K., 2009. Reduced order models of a current source inverter induction motor drive. Am. J. Eng. Applied Sci., 2: 39-43. DOI: 10.3844/ajeassp.2009.39.43

Al-Hasan and A.S. Al-Ghamdi, 2016. Energy balance for a diesel engine operates on a pure biodiesel, diesel fuel and biodiesel-diesel blends. Am. J. Eng. Applied Sci., 9: 458-465. DOI: 10.3844/ajeassp.2016.458.465

Al Smadi, T.A., 2011. Low cost smart sensor design. Am. J. Eng. Applied Sci., 4: 162-168. DOI: 10.3844/ajeassp.2011.162.168

Al Qadi, A.N.S., M.B.A. ALhasanat, A. AL Dahamsheh and S. AL Zaiydneen, 2016a. Using of box-benken method to predict the compressive strength of self-compacting concrete containing Wadi Musa bentonite, Jordan. Am. J. Eng. Applied Sci., 9: 406-411. DOI: 10.3844/ajeassp.2016.406.411

Al Qadi, A.N.S., M.B.A. Alhasanat and M. Haddad, 2016b. Effect of crumb rubber as coarse and fine aggregates on the properties of asphalt concrete. Am. J. Eng. Applied Sci., 9: 558-564. DOI: 10.3844/ajeassp.2016.558.564

Aleksic, S. and A. Lovric, 2011. Energy consumption and environmental implications of wired access networks. Am. J. Eng. Applied Sci., 4: 531-539. DOI: 10.3844/ajeassp.2011.531.539

Alhasanat, M.B., A.N. Al Qadi, O.A. Al Khashman and A. Dahamsheh, 2016. Scanning electron microscopic evaluation of self-compacting concrete spalling at elevated temperatures. Am. J. Eng. Applied Sci., 9: 119-127. DOI: 10.3844/ajeassp.2016.119.127

Ali, K.S. and J.L. Shumaker, 2013. Hardware in the loop simulator for multi-agent unmanned aerial vehicles environment. Am. J. Eng. Applied Sci., 6: 172-177. DOI: 10.3844/ajeassp.2013.172.177

Ali, G.A.M., O. Fouad and S.A. Makhlouf, 2016. Electrical properties of cobalt oxide/silica nanocomposites obtained by sol-gel technique. Am. J. Eng. Applied Sci., 9: 12-16. DOI: 10.3844/ajeassp.2016.12.16

Al-Nasra, M. Daoudb and T.M. Abu-Lebdeh, 2015. The use of the super absorbent polymer as water blocker in concrete structures. Am. J. Eng. Applied Sci., 8: 659-665. DOI: 10.3844/ajeassp.2015.659.665

Alwetaishi, M.S., 2016. Impact of building function on thermal comfort: A review paper. Am. J. Eng. Applied Sci., 9: 928-945. DOI: 10.3844/ajeassp.2016.928.945

Aly, W.M. and M.S. Abuelnasr, 2010. Electronic design automation using object oriented electronics. Am. J. Eng. Applied Sci., 3: 121-127. DOI: 10.3844/ajeassp.2010.121.127

Amani, N., 2016. Design and implementation of optimum management system using cost evaluation and financial analysis for prevention of building failure. Am. J. Eng. Applied Sci., 9: 281-296. DOI: 10.3844/ajeassp.2016.281.296

Amer, S., S. Hamoush and T.M. Abu-Lebdeh, 2015. Experimental evaluation of the raking energy in damping system of steel stud partition walls. Am. J. Eng. Applied Sci., 8: 666-677. DOI: 10.3844/ajeassp.2015.666.677

Anizan, S., K. Yusri, C.S. Leong, N. Amin and S. Zaidi *et al*., 2011. Effects of the contact resistivity variations of the screen-printed silicon solar cell. Am. J. Eng. Applied Sci., 4: 328-331. DOI: 10.3844/ajeassp.2011.328.331

Antonescu, P. and F. Petrescu, 1985. An analytical method of synthesis of cam mechanism and flat stick. Proceedings of the 4th International Symposium on Theory and Practice of Mechanisms, (TPM' 89), Bucharest.

Antonescu, P. and F. Petrescu, 1989. Contributions to kinetoplast dynamic analysis of distribution mechanisms. Bucharest.

Antonescu, P., M. Oprean and F. Petrescu, 1985a. Contributions to the synthesis of oscillating cam mechanism and oscillating flat stick. Proceedings of the 4th International Symposium on Theory and Practice of Mechanisms, (TPM' 85), Bucharest.

Antonescu, P., M. Oprean and F. Petrescu, 1985b. At the projection of the oscillate cams, there are mechanisms and distribution variables. Proceedings of the 5th Conference of Engines, Automobiles, Tractors and Agricultural Machines, (TAM' 58), I-Motors and Cars, Brasov.

Antonescu, P., M. Oprean and F. Petrescu, 1986. Projection of the profile of the rotating camshaft acting on the oscillating plate with disengagement. Proceedings of the 3rd National Computer-aided Design Symposium in the field of Mechanisms and Machine Parts, (MMP' 86), Brasov.

Antonescu, P., M. Oprean and F. Petrescu, 1987. Dynamic analysis of the cam distribution mechanisms. Proceedings of the 7th National Symposium on Industrial Robots and Space Mechanisms, (RSM' 87), Bucharest.

Antonescu, P., M. Oprean and F. Petrescu, 1988. Analytical synthesis of Kurz profile, rotating the flat cam. Mach, Build. Rev.

Antonescu, P., F. Petrescu and O. Antonescu, 1994. Contributions to the synthesis of the rotating cam mechanism and the tip of the balancing tip. Brasov.

Antonescu, P., F. Petrescu and D. Antonescu, 1997. Geometrical synthesis of the rotary cam and balance tappet mechanism. Bucharest, 3: 23-23.

Antonescu, P., F. Petrescu and O. Antonescu, 2000a. Contributions to the synthesis of the rotary disc-cam profile. Proceedings of the 8th International Conference on the Theory of Machines and Mechanisms, (TMM' 00), Liberec, Czech Republic, pp: 51-56.

Antonescu, P., F. Petrescu and O. Antonescu, 2000b. Synthesis of the rotary cam profile with balance follower. Proceedings of the 8th Symposium on Mechanisms and Mechanical Transmissions, (MMT' 00), Timişoara, pp: 39-44.

Antonescu, P., F. Petrescu and O. Antonescu, 2001. Contributions to the synthesis of mechanisms with rotary disc-cam. Proceedings of the 8th IFToMM International Symposium on Theory of Machines and Mechanisms, (TMM' 01), Bucharest, ROMANIA, pp: 31-36.

Ascione, F., N. Bianco, R.F. De Masi, F. de Rossi and C. De Stasio *et al*., 2016. Energy audit of health care facilities: dynamic simulation of energy performances and energy-oriented refurbishment of system and equipment for microclimatic control. Am. J. Eng. Applied Sci., 9: 814-834. DOI: 10.3844/ajeassp.2016.814.834

Augustine, A., R.D. Prakash, R. Xavier and M.C. Parassery, 2016. Review of signal processing techniques for detection of power quality events. Am. J. Eng. Applied Sci., 9: 364-370. DOI: 10.3844/ajeassp.2016.364.370

Aversa, R., R.V.V. Petrescu, A. Apicella and F.I.T. Petrescu, 2017a. Nano-diamond hybrid materials for structural biomedical application. Am. J. Biochem. Biotechnol., 13: 34-41. DOI: 10.3844/ajbbsp.2017.34.41

Aversa, R., R.V. Petrescu, B. Akash, R.B. Bucinell and J.M. Corchado *et al*., 2017b. Kinematics and forces to a new model forging manipulator. Am. J. Applied Sci., 14: 60-80. DOI: 10.3844/ajassp.2017.60.80

Aversa, R., R.V. Petrescu, A. Apicella, F.I.T. Petrescu and J.K. Calautit *et al*., 2017c. Something about the V engines design. Am. J. Applied Sci., 14: 34-52. DOI: 10.3844/ajassp.2017.34.52

Aversa, R., D. Parcesepe, R.V.V. Petrescu, F. Berto and G. Chen *et al*., 2017d. Process ability of bulk metallic glasses. Am. J. Applied Sci., 14: 294-301. DOI: 10.3844/ajassp.2017.294.301

Aversa, R., R.V.V. Petrescu, B. Akash, R.B. Bucinell and J.M. Corchado *et al*., 2017e. Something about the balancing of thermal motors. Am. J. Eng. Applied Sci., 10: 200.217. DOI: 10.3844/ajeassp.2017.200.217

Aversa, R., F.I.T. Petrescu, R.V. Petrescu and A. Apicella, 2016a. Biomimetic FEA bone modeling for customized hybrid biological prostheses development. Am. J. Applied Sci., 13: 1060-1067. DOI: 10.3844/ajassp.2016.1060.1067

Aversa, R., D. Parcesepe, R.V. Petrescu, G. Chen and F.I.T. Petrescu *et al*., 2016b. Glassy amorphous metal injection molded induced morphological defects. Am. J. Applied Sci., 13: 1476-1482. DOI: 10.3844/ajassp.2016.1476.1482

Aversa, R., R.V. Petrescu, F.I.T. Petrescu and A. Apicella, 2016c. Smart-factory: Optimization and process control of composite centrifuged pipes. Am. J. Applied Sci., 13: 1330-1341. DOI: 10.3844/ajassp.2016.1330.1341

Aversa, R., F. Tamburrino, R.V. Petrescu, F.I.T. Petrescu and M. Artur *et al*., 2016d. Biomechanically inspired shape memory effect machines driven by muscle like acting NiTi alloys. Am. J. Applied Sci., 13: 1264-1271. DOI: 10.3844/ajassp.2016.1264.1271

Aversa, R., E.M. Buzea, R.V. Petrescu, A. Apicella and M. Neacsa *et al*., 2016e. Present a mechatronic system having able to determine the concentration of carotenoids. Am. J. Eng. Applied Sci., 9: 1106-1111. DOI: 10.3844/ajeassp.2016.1106.1111

Aversa, R., R.V. Petrescu, R. Sorrentino, F.I.T. Petrescu and A. Apicella, 2016f. Hybrid ceramo-polymeric nanocomposite for biomimetic scaffolds design and preparation. Am. J. Eng. Applied Sci., 9: 1096-1105. DOI: 10.3844/ajeassp.2016.1096.1105

Aversa, R., V. Perrotta, R.V. Petrescu, C. Misiano and F.I.T. Petrescu *et al*., 2016g. From structural colors to super-hydrophobicity and achromatic transparent protective coatings: Ion plating plasma assisted TiO_2 and SiO_2 nano-film deposition. Am. J. Eng. Applied Sci., 9: 1037-1045. DOI: 10.3844/ajeassp.2016.1037.1045

Aversa, R., R.V. Petrescu, F.I.T. Petrescu and A. Apicella, 2016h. Biomimetic and evolutionary design driven innovation in sustainable products development. Am. J. Eng. Applied Sci., 9: 1027-1036. DOI: 10.3844/ajeassp.2016.1027.1036

Aversa, R., R.V. Petrescu, A. Apicella and F.I.T. Petrescu, 2016i. Mitochondria are naturally micro robots - a review. Am. J. Eng. Applied Sci., 9: 991-1002. DOI: 10.3844/ajeassp.2016.991.1002

Aversa, R., R.V. Petrescu, A. Apicella and F.I.T. Petrescu, 2016j. We are addicted to vitamins C and E-A review. Am. J. Eng. Applied Sci., 9: 1003-1018. DOI: 10.3844/ajeassp.2016.1003.1018

Aversa, R., R.V. Petrescu, A. Apicella and F.I.T. Petrescu, 2016k. Physiologic human fluids and swelling behavior of hydrophilic biocompatible hybrid ceramo-polymeric materials. Am. J. Eng. Applied Sci., 9: 962-972. DOI: 10.3844/ajeassp.2016.962.972

Aversa, R., R.V. Petrescu, A. Apicella and F.I.T. Petrescu, 2016l. One can slow down the aging through antioxidants. Am. J. Eng. Applied Sci., 9: 1112-1126. DOI: 10.3844/ajeassp.2016.1112.1126

Aversa, R., R.V. Petrescu, A. Apicella and F.I.T. Petrescu, 2016m. About homeopathy or ≪Similia Similibus Curentur≫. Am. J. Eng. Applied Sci., 9: 1164-1172. DOI: 10.3844/ajeassp.2016.1164.1172

Aversa, R., R.V. Petrescu, A. Apicella and F.I.T. Petrescu, 2016n. The basic elements of life's. Am. J. Eng. Applied Sci., 9: 1189-1197. DOI: 10.3844/ajeassp.2016.1189.1197

Aversa, R., F.I.T. Petrescu, R.V. Petrescu and A. Apicella, 2016o. Flexible stem trabecular prostheses. Am. J. Eng. Applied Sci., 9: 1213-1221. DOI: 10.3844/ajeassp.2016.1213.122

Babayemi, A.K., 2016. Thermodynamics, non-linear isotherms, statistical modeling and optimization of phosphorus adsorption from wastewater. Am. J. Eng. Applied Sci., 9: 1019-1026. DOI: 10.3844/ajeassp.2016.1019.1026

Bakar, R.A., M.K. Mohammed and M.M. Rahman, 2009. Numerical study on the performance characteristics of hydrogen fueled port injection internal combustion engine. Am. J. Eng. Applied Sci., 2: 407-415. DOI: 10.3844/ajeassp.2009.407.415

Barone, G., A. Buonomano, C. Forzano and A. Palombo, 2016. WLHP systems in commercial buildings: A case study analysis based on a dynamic simulation approach. Am. J. Eng. Applied Sci., 9: 659-668. DOI: 10.3844/ajeassp.2016.659.668

Bedon, C., 2016. Review on the use of FRP composites for facades and building skins. Am. J. Eng. Applied Sci., 9: 713-723. DOI: 10.3844/ajeassp.2016.713.723

Bedon, C. and C. Amadio, 2016. A unified approach for the shear buckling design of structural glass walls with non-ideal restraints. Am. J. Eng. Applied Sci., 9: 64-78. DOI: 10.3844/ajeassp.2016.64.78

Bedon, C. and C. Louter, 2016. Finite-element numerical simulation of the bending performance of post-tensioned structural glass beams with adhesively bonded CFRP tendons. Am. J. Eng. Applied Sci., 9: 680-691. DOI: 10.3844/ajeassp.2016.680.691

M., Ben-Faress, A., Elouadi and D., Gretete, 2019. Global Supply Chain Risk Management. Am. J. Eng. Applied Sci., 12(2):147-155. DOI: 10.3844/ajeassp.2019.147.155

Bier, H. and S. Mostafavi, 2015. Structural optimization for materially informed design to robotic production processes. Am. J. Eng. Applied Sci., 8: 549-555. DOI: 10.3844/ajeassp.2015.549.555

Bolonkin, A., 2009a. Femtotechnology: Nuclear matter with fantastic properties. Am. J. Eng. Applied Sci., 2: 501-514. DOI: 10.3844/ajeassp.2009.501.514

Bolonkin, A., 2009b. Converting of matter to nuclear energy by ab-generator. Am. J. Eng. Applied Sci., 2: 683-693. DOI: 10.3844/ajeassp.2009.683.693

Boucetta, A., 2008. Vector control of a variable reluctance machine stator and rotor discs imbricates. Am. J. Eng. Applied Sci., 1: 260-265. DOI: 10.3844/ajeassp.2008.260.265

Bourahla, N. and A. Blakeborough, 2015. Similitude distortion compensation for a small scale model of a knee braced steel frame. Am. J. Eng. Applied Sci., 8: 481-488. DOI: 10.3844/ajeassp.2015.481.488

Bucinell, R.B., 2016. Stochastic model for variable amplitude fatigue induced delamination growth in graphite/epoxy laminates. Am. J. Eng. Applied Sci., 9: 635-646. DOI: 10.3844/ajeassp.2016.635.646

Budak, S., Z. Xiao, B. Johnson, J. Cole and M. Drabo *et al*., 2016. Highly-efficient advanced thermoelectric devices from different multilayer thin films. Am. J. Eng. Applied Sci., 9: 356-363. DOI: 10.3844/ajeassp.2016.356.363

Buonomano, A., F. Calise and M. Vicidomini, 2016a. A novel prototype of a small-scale solar power plant: Dynamic simulation and thermoeconomic analysis. Am. J. Eng. Applied Sci., 9: 770-788. DOI: 10.3844/ajeassp.2016.770.788

Buonomano, A., F. Calise, M.D. d'Accadia, R. Vanoli and M. Vicidomini, 2016b. Simulation and experimental analysis of a demonstrative solar heating and cooling plant installed in Naples (Italy). Am. J. Eng. Applied Sci., 9: 798-813. DOI: 10.3844/ajeassp.2016.798.813

Cao, W., H. Ding, Z. Bin and C. Ziming, 2013. New structural representation and digital-analysis platform for symmetrical parallel mechanisms. Int. J. Adv. Robotic Sys. DOI: 10.5772/56380

Calise, F., M.D. dâ' Accadia, L. Libertini, E. Quiriti and M. Vicidomini, 2016b. Dynamic simulation and optimum operation strategy of a trigeneration system serving a hospital. Am. J. Eng. Applied Sci., 9: 854-867. DOI: 10.3844/ajeassp.2016.854.867

Campo, T., M. Cotto, F. Marquez, E. Elizalde and C. Morant, 2016. Graphene synthesis by plasma-enhanced CVD growth with ethanol. Am. J. Eng. Applied Sci., 9: 574-583. DOI: 10.3844/ajeassp.2016.574.583

Cardu, M., P. Oreste and T. Cicala, 2009. Analysis of the tunnel boring machine advancement on the Bologna-Florence railway link. Am. J. Eng. Applied Sci., 2: 416-420. DOI: 10.3844/ajeassp.2009.416.420

Casadei, D., 2015. Bayesian statistical inference for number counting experiments. Am. J. Eng. Applied Sci., 8: 730-735. DOI: 10.3844/ajeassp.2015.730.735

Calise, F., M.D. dâ' Accadia, L. Libertini, E. Quiriti and M. Vicidomini, 2016b. Dynamic simulation and optimum operation strategy of a trigeneration system serving a hospital. Am. J. Eng. Applied Sci., 9: 854-867. DOI: 10.3844/ajeassp.2016.854.867

Campo, T., M. Cotto, F. Marquez, E. Elizalde and C. Morant, 2016. Graphene synthesis by plasma-enhanced CVD growth with ethanol. Am. J. Eng. Applied Sci., 9: 574-583. DOI: 10.3844/ajeassp.2016.574.583

Cardu, M., P. Oreste and T. Cicala, 2009. Analysis of the tunnel boring machine advancement on the Bologna-Florence railway link. Am. J. Eng. Applied Sci., 2: 416-420. DOI: 10.3844/ajeassp.2009.416.420

Casadei, D., 2015. Bayesian statistical inference for number counting experiments. Am. J. Eng. Applied Sci., 8: 730-735. DOI: 10.3844/ajeassp.2015.730.735

Comanescu, A., 2010. Bazele Modelarii Mecanismelor. 1st Edn., E. Politeh, Press, Bucureşti, pp: 274.

Darabi, A., S.A. Soleamani and A. Hassannia, 2008. Fuzzy based digital automatic voltage regulator of a synchronous generator with unbalanced loads. Am. J. Eng. Applied Sci., 1: 280-286. DOI: 10.3844/ajeassp.2008.280.286

Daud, H., N. Yahya, A.A. Aziz and M.F. Jusoh, 2008. Development of wireless electric concept powering electrical appliances. Am. J. Eng. Applied Sci., 1: 12-15. DOI: 10.3844/ajeassp.2008.12.15

J., De León, M., del C. Cotto, and F., Márquez, 2019. Toxicology of Nanomaterials on Zebrafish. Am. J. Eng. Applied Sci., 12(2):193-203. DOI: 10.3844/ajeassp.2019.193.203

Demetriou, D., N. Nikitas and K.D. Tsavdaridis, 2015. Semi active tuned mass dampers of buildings: A simple control option. Am. J. Eng. Applied Sci., 8: 620-632. DOI: 10.3844/ajeassp.2015.620.632

Dixit, S. and S. Pal, 2015. Synthesis and characterization of ink (Carbon)-perovskite/polyaniline ternary composite electrode for sodium chloride separation. Am. J. Eng. Applied Sci., 8: 527-537. DOI: 10.3844/ajeassp.2015.527.537

Djalel, D., M. Mourad and H. Labar, 2013. New approach of electromagnetic fields of the lightning discharge. Am. J. Eng. Applied Sci., 6: 369-383. DOI: 10.3844/ajeassp.2013.369.383

Dong, H., N. Giakoumidis, N. Figueroa and N. Mavridis, 2013. Approaching behaviour monitor and vibration indication in developing a General Moving Object Alarm System (GMOAS). Int. J. Adv. Robotic Sys. DOI: 10.5772/56586

Ebrahim, N.A., S. Ahmed, S.H.A. Rashid and Z. Taha, 2012. Technology use in the virtual R&D teams. Am. J. Eng. Applied Sci., 5: 9-14. DOI: 10.3844/ajeassp.2012.9.14

El-Labban, H.F., M. Abdelaziz and E.R.I. Mahmoud, 2013. Modification of carbon steel by laser surface melting: Part I: Effect of laser beam travelling speed on microstructural features and surface hardness. Am. J. Eng. Applied Sci., 6: 352-359. DOI: 10.3844/ajeassp.2013.352.359

Elliott, A., S. AlSalihi, A.L. Merriman and M.M. Basti, 2016. Infiltration of nanoparticles into porous binder jet printed parts. Am. J. Eng. Applied Sci., 9: 128-133. DOI: 10.3844/ajeassp.2016.128.133

Elmeddahi, Y., H. Mahmoudi, A. Issaadi, M.F.A. Goosen and R. Ragab, 2016b. Evaluating the effects of climate change and variability on water resources: A case study of the Cheliff Basin in Algeria. Am. J. Eng. Applied Sci., 9: 835-845. DOI: 10.3844/ajeassp.2016.835.845

El-Tous, Y., 2008. Pitch angle control of variable speed wind turbine. Am. J. Eng. Applied Sci., 1: 118-120. DOI: 10.3844/ajeassp.2008.118.120

Faizal, A., S. Mulyono, R. Yendra and A. Fudholi, 2016. Design Maximum Power Point Tracking (MPPT) on photovoltaic panels using fuzzy logic method. Am. J. Eng. Applied Sci., 9: 789-797. DOI: 10.3844/ajeassp.2016.789.797

Farahani, A.S., N.M. Adam and M.K.A. Ariffin, 2010. Simulation of airflow and aerodynamic forces acting on a rotating turbine ventilator. Am. J. Eng. Applied Sci., 3: 159-170. DOI: 10.3844/ajeassp.2010.159.170

Farokhi, E. and M. Gordini, 2015. Investigating the parameters influencing the behavior of knee braced steel structures. Am. J. Eng. Applied Sci., 8: 567-574. DOI: 10.3844/ajeassp.2015.567.574

Fathallah, A.Z.M. and R.A. Bakar, 2009. Prediction studies for the performance of a single cylinder high speed spark ignition linier engine with spring mechanism as return cycle. Am. J. Eng. Applied Sci., 2: 713-720. DOI: 10.3844/ajeassp.2009.713.720

Fen, Y.W., W.M.M. Yunus, M.M. Moksin, Z.A. Talib and N.A. Yusof, 2011. Optical properties of crosslinked chitosan thin film with glutaraldehyde using surface plasmon resonance technique. Am. J. Eng. Applied Sci., 4: 61-65. DOI: 10.3844/ajeassp.2011.61.65

Feraga, C.E., A. Moussaoui, A. Bouldjedri and A. Yousfi, 2009. Robust position controller for a permanent magnet synchronous actuator. Am. J. Eng. Applied Sci., 2: 388-392. DOI: 10.3844/ajeassp.2009.388.392

K., Fontánez, A., García, M., del C Cotto-Maldonado, J., Duconge, C., Morant, S., Pinilla, and F., Márquez, 2019. Development of Ionizing Radiation Sensors Based on Carbon Nanotubes. Am. J. Eng. Applied Sci., 12: 185-192. DOI: 10.3844/ajeassp.2019.185.192

Franklin, D.J., 1930. Ingenious Mechanisms for Designers and Inventors. 1st Edn., Industrial Press Publisher.

Fu, Y.F., J. Gong, H. Huang, Y.J. Liu and D. Zhu *et al*., 2015. Parameters optimization of adaptive cashew shelling cutter based on BP neural network and genetic algorithm. Am. J. Eng. Applied Sci., 8: 648-658. DOI: 10.3844/ajeassp.2015.648.658

Ge, L. and X. Xu, 2015. A scheme design of cloud + end technology in demand side management. Am. J. Eng. Applied Sci., 8: 736-747. DOI: 10.3844/ajeassp.2015.736.747

Gupta, P., A. Gupta and A. Asati, 2015. Ultra low power MUX based compressors for wallace and dadda multipliers in sub-threshold regime. Am. J. Eng. Applied Sci., 8: 702-716. DOI: 10.3844/ajeassp.2015.702.716

Gusti, A.P. and Semin, 2016. The effect of vessel speed on fuel consumption and exhaust gas emissions. Am. J. Eng. Applied Sci., 9: 1046-1053. DOI: 10.3844/ajeassp.2016.1046.1053

Hassan, M., H. Mahjoub and M. Obed, 2012. Voice-based control of a DC servo motor. Am. J. Eng. Applied Sci., 5: 89-92. DOI: 10.3844/ajeassp.2012.89.92

Hasan, S. and M.H. El-Naas, 2016. Optimization of a combined approach for the treatment of carbide slurry and capture of CO_2. Am. J. Eng. Applied Sci., 9: 449-457. DOI: 10.3844/ajeassp.2016.449.457

He, B., Z. Wang, Q. Li, H. Xie and R. Shen, 2013. An analytic method for the kinematics and dynamics of a multiple-backbone continuum robot. IJARS. DOI: 10.5772/54051

Helmy, A.K. and G.S. El-Taweel, 2010. Neural network change detection model for satellite images using textural and spectral characteristics. Am. J. Eng. Applied Sci., 3: 604-610. DOI: 10.3844/ajeassp.2010.604.610

Hirun, W., 2016. Evaluation of interregional freight generation modelling methods by using nationwide commodity flow survey data. Am. J. Eng. Applied Sci., 9: 625-634. DOI: 10.3844/ajeassp.2016.625.634

Ho, C.Y.F., B.W.K. Ling, S.G. Blasi, Z.W. Chi and W.C. Siu, 2011. Single step optimal block matched motion estimation with motion vectors having arbitrary pixel precisions. Am. J. Eng. Applied Sci., 4: 448-460. DOI: 10.3844/ajeassp.2011.448.460

Huang, B., S.H. Masood, M. Nikzad, P.R. Venugopal and A. Arivazhagan, 2016. Dynamic mechanical properties of fused deposition modelling processed polyphenylsulfone material. Am. J. Eng. Applied Sci., 9: 1-11. DOI: 10.3844/ajeassp.2016.1.11

BP., Hypolite, W.T., Evariste, and M.I., Adolphe, 2019. A 10GHZ Low-Offset Dynamic Comparator for High-Speed and Lower-Power ADCS. Am. J. Eng. Applied Sci., 12(2):156-165. DOI: 10.3844/ajeassp.2019.156.165

Idarwazeh, S., 2011. Inverse discrete Fourier transform-discrete Fourier transform techniques for generating and receiving spectrally efficient frequency division multiplexing signals. Am. J. Eng. Applied Sci., 4: 598-606. DOI: 10.3844/ajeassp.2011.598.606

Iqbal, 2016. An overview of Energy Loss Reduction (ELR) software used in Pakistan by WAPDA for calculating transformer overloading, line losses and energy losses. Am. J. Eng. Applied Sci., 9: 442-448. DOI: 10.3844/ajeassp.2016.442.448

Ismail, M.I.S., Y. Okamoto, A. Okada and Y. Uno, 2011. Experimental investigation on micro-welding of thin stainless steel sheet by fiber laser. Am. J. Eng. Applied Sci., 4: 314-320. DOI: 10.3844/ajeassp.2011.314.320

Jaber, A.A. and R. Bicker, 2016. Industrial robot fault detection based on statistical control chart. Am. J. Eng. Applied Sci., 9: 251-263. DOI: 10.3844/ajeassp.2016.251.263

Jafari, N., A. Alsadoon, C.P. Withana, A. Beg and A. Elchouemi, 2016. Designing a comprehensive security framework for smartphones and mobile devices. Am. J. Eng. Applied Sci., 9: 724-734. DOI: 10.3844/ajeassp.2016.724.734

Jalil, M.I.A. and J. Sampe, 2013. Experimental investigation of thermoelectric generator modules with different technique of cooling system. Am. J. Eng. Applied Sci., 6: 1-7. DOI: 10.3844/ajeassp.2013.1.7

Jaoude, A.A. and K. El-Tawil, 2013. Analytic and nonlinear prognostic for vehicle suspension systems. Am. J. Eng. Applied Sci., 6: 42-56. DOI: 10.3844/ajeassp.2013.42.56

Jarahi, H., 2016. Probabilistic seismic hazard deaggregation for Karaj City (Iran). Am. J. Eng. Applied Sci., 9: 520-529. DOI: 10.3844/ajeassp.2016.520.529

Jarahi, H. and S. Seifilaleh, 2016. Rock fall hazard zonation in Haraz Highway. Am. J. Eng. Applied Sci., 9: 371-379. DOI: 10.3844/ajeassp.2016.371.379

Jauhari, K., A. Widodo and I. Haryanto, 2016. Identification of a machine tool spindle critical frequency through modal and imbalance response analysis. Am. J. Eng. Applied Sci., 9: 213-221. DOI: 10.3844/ajeassp.2016.213.221

Jiang, J., Q. Chen and S. Nimbalkar, 2016. Field data based method for predicting long-term settlements. Am. J. Eng. Applied Sci., 9: 466-476. DOI: 10.3844/ajeassp.2016.466.476

Kaewnai, S. and S. Wongwises, 2011. Improvement of the runner design of Francis turbine using computational fluid dynamics. Am. J. Eng. Applied Sci., 4: 540-547. DOI: 10.3844/ajeassp.2011.540.547

Khalifa, A.H.N., A.H. Jabbar and J.A. Muhsin, 2015. Effect of exhaust gas temperature on the performance of automobile adsorption air-conditioner. Am. J. Eng. Applied Sci., 8: 575-581. DOI: 10.3844/ajeassp.2015.575.581

Khalil, R., 2015. Credibility of 3D volume computation using GIS for pit excavation and roadway constructions. Am. J. Eng. Applied Sci., 8: 434-442. DOI: 10.3844/ajeassp.2015.434.442

Kamble, V.G. and N. Kumar, 2016. Fabrication and tensile property analysis of polymer matrix composites of graphite and silicon carbide as fillers. Am. J. Eng. Applied Sci., 9: 17-30. DOI: 10.3844/ajeassp.2016.17.30

Kazakov, V.V., V.I. Yusupov, V.N. Bagratashvili, A.I. Pavlikov and V.A. Kamensky, 2016. Control of bubble formation at the optical fiber tip by analyzing ultrasound acoustic waves. Am. J. Eng. Applied Sci., 9: 921-927. DOI: 10.3844/ajeassp.2016.921.927

Kechiche, O.B.H.B., H.B.A. Sethom, H. Sammoud and I.S. Belkhodja, 2011. Optimized high-frequency signal injection based permanent magnet synchronous motor rotor position estimation applied to washing machines. Am. J. Eng. Applied Sci., 4: 390-399. DOI: 10.3844/ajeassp.2011.390.399

Kuli, I., T.M. Abu-Lebdeh, E.H. Fini and S.A. Hamoush, 2016. The use of nano-silica for improving mechanical properties of hardened cement paste. Am. J. Eng. Applied Sci., 9: 146-154. DOI: 10.3844/ajeassp.2016.146.154

Kumar, N.D., R.D. Ravali and PR. Srirekha, 2015. Design and realization of pre-amplifier and filters for on-board radar system. Am. J. Eng. Applied Sci., 8: 689-701. DOI: 10.3844/ajeassp.2015.689.701

Kunanoppadon, J., 2010. Thermal efficiency of a combined turbocharger set with gasoline engine. Am. J. Eng. Applied Sci., 3: 342-349. DOI: 10.3844/ajeassp.2010.342.349

Kwon, S., Y. Tani, H. Okubo and T. Shimomura, 2010. Fixed-star tracking attitude control of spacecraft using single-gimbal control moment gyros. Am. J. Eng. Applied Sci., 3: 49-55. DOI: 10.3844/ajeassp.2010.49.55

Lamarre, A., E.H. Fini and T.M. Abu-Lebdeh, 2016. Investigating effects of water conditioning on the adhesion properties of crack sealant. Am. J. Eng. Applied Sci., 9: 178-186. DOI: 10.3844/ajeassp.2016.178.186

Lee, B.J., 2013. Geometrical derivation of differential kinematics to calibrate model parameters of flexible manipulator. Int. J. Adv. Robotic Sys. DOI: 10.5772/55592

Li, R., B. Zhang, S. Xiu, H. Wang and L. Wang *et al*., 2015. Characterization of solid residues obtained from supercritical ethanol liquefaction of swine manure. Am. J. Eng. Applied Sci., 8: 465- 470. DOI: 10.3844/ajeassp.2015.465.470

Lin, W., B. Li, X. Yang and D. Zhang, 2013. Modelling and control of inverse dynamics for a 5-DOF parallel kinematic polishing machine. Int. J. Adv. Robotic Sys. DOI: 10.5772/54966

Liu, H., W. Zhou, X. Lai and S. Zhu, 2013. An efficient inverse kinematic algorithm for a PUMA560-structured robot manipulator. IJARS. DOI: 10.5772/56403

Lubis, Z., A.N. Abdalla, Mortaza and R. Ghon, 2009. Mathematical modeling of the three phase induction motor couple to DC motor in hybrid electric vehicle. Am. J. Eng. Applied Sci., 2: 708-712. DOI: 10.3844/ajeassp.2009.708.712

Madani, D.A. and A. Dababneh, 2016. Rapid entire body assessment: A literature review. Am. J. Eng. Applied Sci., 9: 107-118. DOI: 10.3844/ajeassp.2016.107.118

Malomar, G.E.B., A. Gueye, C. Mbow, V.B. Traore and A.C. Beye, 2016. Numerical study of natural convection in a square porous cavity thermally modulated on both side walls. Am. J. Eng. Applied Sci., 9: 591-598. DOI: 10.3844/ajeassp.2016.591.598

Mansour, M.A.A., 2016. Developing an anthropometric database for Saudi students and comparing Saudi dimensions relative to Turkish and Iranian peoples. Am. J. Eng. Applied Sci., 9: 547-557. DOI: 10.3844/ajeassp.2016.547.557

Maraveas, C., Z.C. Fasoulakis and K.D. Tsavdaridis, 2015. A review of human induced vibrations on footbridges. Am. J. Eng. Applied Sci., 8: 422-433. DOI: 10.3844/ajeassp.2015.422.433

Marghany, M. and M. Hashim, 2009. Robust of doppler centroid for mapping sea surface current by using radar satellite data. Am. J. Eng. Applied Sci., 2: 781-788. DOI: 10.3844/ajeassp.2009.781.788

Martins, F.R., A.R. Gonçalves and E.B. Pereira, 2016. Observational study of wind shear in northeastern Brazil. Am. J. Eng. Applied Sci., 9: 484-504. DOI: 10.3844/ajeassp.2016.484.504

Marzuki, M.A.L.B., M.H. Abd Halim and A.R.N. Mohamed, 2015. Determination of natural frequencies through modal and harmonic analysis of space frame race car chassis based on ANSYS. Am. J. Eng. Applied Sci., 8: 538-548. DOI: 10.3844/ajeassp.2015.538.548

Mavukkandy, M.O., S. Chakraborty, T. Abbasi and S.A. Abbasi, 2016. A clean-green synthesis of platinum nanoparticles utilizing a pernicious weed lantana (Lantana Camara). Am. J. Eng. Applied Sci., 9: 84-90. DOI: 10.3844/ajeassp.2016.84.90

Minghini, F., N. Tullini and F. Ascione, 2016. Updating Italian design guide CNR DT-205/2007 in view of recent research findings: Requirements for pultruded FRP profiles. Am. J. Eng. Applied Sci., 9: 702-712. DOI: 10.3844/ajeassp.2016.702.712

Moezi, N., D. Dideban and A. Ketabi, 2008. A novel integrated SET based inverter for nano power electronic applications. Am. J. Eng. Applied Sci., 1: 219-222. DOI: 10.3844/ajeassp.2008.219.222

Mohamed, M.A., A.Y. Tuama, M. Makhtar, M.K. Awang and M. Mamat, 2016. The effect of RSA exponential key growth on the multi-core computational resource. Am. J. Eng. Applied Sci., 9: 1054-1061. DOI: 10.3844/ajeassp.2016.1054.1061

Mohan, K.S.R., P. Jayabalan and A. Rajaraman, 2012. Properties of fly ash based coconut fiber composite. Am. J. Eng. Applied Sci., 5: 29-34. DOI: 10.3844/ajeassp.2012.29.34

Mohseni, E. and K.D. Tsavdaridis, 2016. Effect of nano-alumina on pore structure and durability of class f fly ash self-compacting mortar. Am. J. Eng. Applied Sci., 9: 323-333. DOI: 10.3844/ajeassp.2016.323.333

Momani, M.A., T.A. Al Smadi, FM. Al Taweel and K.A. Ghaidan, 2011. GPS ionospheric total electron content and scintillation measurements during the October 2003 magnetic storm. Am. J. Eng. Applied Sci., 4: 301-306. DOI: 10.3844/ajeassp.2011.301.306

Momta, P.S., J.O. Omoboh and M.I. Odigi, 2015. Sedimentology and depositional environment of D2 sand in part of greater ughelli depobelt, onshore Niger Delta, Nigeria. Am. J. Eng. Applied Sci., 8: 556-566. DOI: 10.3844/ajeassp.2015.556.566

Mondal, R., S. Sahoo and C.S. Rout, 2016. Mixed nickel cobalt manganese oxide nanorods for supercapacitor application. Am. J. Eng. Applied Sci., 9: 540-546. DOI: 10.3844/ajeassp.2016.540.546

Montgomery, J., T.M. Abu-Lebdeh, S.A. Hamoush and M. Picornell, 2016. Effect of nano-silica on the compressive strength of harden cement paste at different stages of hydration. Am. J. Eng. Applied Sci., 9: 166-177. DOI: 10.3844/ajeassp.2016.166.177

Moretti, M.L., 2015. Seismic design of masonry and reinforced concrete infilled frames: A comprehensive overview. Am. J. Eng. Applied Sci., 8: 748-766. DOI: 10.3844/ajeassp.2015.748.766

Morse, A., M.M. Mansfield, R.M. Alley, H.A. Kerr and R.B. Bucinell, 2016b. Traction enhancing products affect maximum torque at the shoe-floor interface: A potential increased risk of ACL injury. Am. J. Eng. Applied Sci., 9: 889-893. DOI: 10.3844/ajeassp.2016.889.893

Moubarek, T. and A. Gharsallah, 2016. A six-port reflectometer calibration using Wilkinson power divider. Am. J. Eng. Applied Sci., 9: 274-280. DOI: 10.3844/ajeassp.2016.274.280

Nabilou, A., 2016a. Effect of parameters of selection and replacement drilling bits based on geo-mechanical factors: (Case study: Gas and oil reservoir in the Southwest of Iran). Am. J. Eng. Applied Sci., 9: 380-395. DOI: 10.3844/ajeassp.2016.380.395

Nabilou, A., 2016b. Study of the parameters of Steam Assisted Gravity Drainage (SAGD) method for enhanced oil recovery in a heavy oil fractured carbonate reservoir. Am. J. Eng. Applied Sci., 9: 647-658. DOI: 10.3844/ajeassp.2016.647.658

Nachiengtai, T., W. Chim-Oye, S. Teachavorasinskun and W. Sa-Ngiamvibool, 2008. Identification of shear band using elastic shear wave propagation. Am. J. Eng. Applied Sci., 1: 188-191. DOI: 10.3844/ajeassp.2008.188.191

Nahas, R. and S.P. Kozaitis, 2014. Metric for the fusion of synthetic and real imagery from multimodal sensors. Am. J. Eng. Applied Sci., 7: 355-362. DOI: 10.3844/ajeassp.2014.355.362

Nandhakumar, S., V. Selladurai and S. Sekar, 2009. Numerical investigation of an industrial robot arm control problem using haar wavelet series. Am. J. Eng. Applied Sci., 2: 584-589. DOI: 10.3844/ajeassp.2009.584.589

Ng, K.C., M.Z. Yusoff, K. Munisamy, H. Hasini and N.H. Shuaib, 2008. Time-marching method for computations of high-speed compressible flow on structured and unstructured grid. Am. J. Eng. Applied Sci., 1: 89-94. DOI: 10.3844/ajeassp.2008.89.94

Obaiys, S.J., Z. Abbas, N.M.A. Nik Long, A.F. Ahmad and A. Ahmedov *et al*., 2016. On the general solution of first-kind hypersingular integral equations. Am. J. Eng. Applied Sci., 9: 195-201. DOI: 10.3844/ajeassp.2016.195.201

Odeh, S., R. Faqeh, L. Abu Eid and N. Shamasneh, 2009. Vision-based obstacle avoidance of mobile robot using quantized spatial model. Am. J. Eng. Applied Sci., 2: 611-619. DOI: 10.3844/ajeassp.2009.611.619

Ong, A.T., A. Mustapha, Z.B. Ibrahim, S. Ramli and B.C. Eong, 2015. Real-time automatic inspection system for the classification of PCB flux defects. Am. J. Eng. Applied Sci., 8: 504-518. DOI: 10.3844/ajeassp.2015.504.518

Opafunso, Z.O., I.I. Ozigis and I.A. Adetunde, 2009. Pneumatic and hydraulic systems in coal fluidized bed combustor. Am. J. Eng. Applied Sci., 2: 88-95. DOI: 10.3844/ajeassp.2009.88.95

Orlando, N. and E. Benvenuti, 2016. Advanced XFEM simulation of pull-out and debonding of steel bars and FRP-reinforcements in concrete beams. Am. J. Eng. Applied Sci., 9: 746-754. DOI: 10.3844/ajeassp.2016.746.754

Pannirselvam, N., P.N. Raghunath and K. Suguna, 2008. Neural network for performance of glass fibre reinforced polymer plated RC beams. Am. J. Eng. Applied Sci., 1: 82-88. DOI: 10.3844/ajeassp.2008.82.88

Pattanasethanon, S., 2010. The solar tracking system by using digital solar position sensor. Am. J. Eng. Applied Sci., 3: 678-682. DOI: 10.3844/ajeassp.2010.678.682

Pérez-de León, G., V.E. Lamberti, R.D. Seals, T.M. Abu-Lebdeh and S.A. Hamoush, 2016. Gas atomization of molten metal: Part I. Numerical modeling conception. Am. J. Eng. Applied Sci., 9: 303-322. DOI: 10.3844/ajeassp.2016.303.322

Padula, F. and V. Perdereau, 2013. An on-line path planner for industrial manipulators. Int. J. Adv. Robotic Sys. DOI: 10.5772/55063

Perumaal, S. and N. Jawahar, 2013. Automated trajectory planner of industrial robot for pick-and-place task. IJARS. DOI: 10.5772/53940

Petrescu, F. and R. Petrescu, 1995a. Contributions to optimization of the polynomial motion laws of the stick from the internal combustion engine distribution mechanism. Bucharest, 1: 249-256.

Petrescu, F. and R. Petrescu, 1995b. Contributions to the synthesis of internal combustion engine distribution mechanisms. Bucharest, 1: 257-264.

Petrescu, F. and R. Petrescu, 1997a. Dynamics of cam mechanisms (exemplified on the classic distribution mechanism). Bucharest, 3: 353-358.

Petrescu, F. and R. Petrescu, 1997b. Contributions to the synthesis of the distribution mechanisms of internal combustion engines with a Cartesian coordinate method. Bucharest, 3: 359-364.

Petrescu, F. and R. Petrescu, 1997c. Contributions to maximizing polynomial laws for the active stroke of the distribution mechanism from internal combustion engines. Bucharest, 3: 365-370.

Petrescu, F. and R. Petrescu, 2000a. Synthesis of distribution mechanisms by the rectangular (Cartesian) coordinate method. Proceedings of the 8th National Conference on International Participation, (CIP' 00), Craiova, Romania, pp: 297-302.

Petrescu, F. and R. Petrescu, 2000b. The design (synthesis) of cams using the polar coordinate method (triangle method). Proceedings of the 8th National Conference on International Participation, (CIP' 00), Craiova, Romania, pp: 291-296.

Petrescu, F. and R. Petrescu, 2002a. Motion laws for cams. Proceedings of the International Computer Assisted Design, National Symposium with Participation, (SNP' 02), Braşov, pp: 321-326.

Petrescu, F. and R. Petrescu, 2002b. Camshaft dynamics elements. Proceedings of the International Computer Assisted Design, National Participation Symposium, (SNP' 02), Braşov, pp: 327-332.

Petrescu, F. and R. Petrescu, 2003. Some elements regarding the improvement of the engine design. Proceedings of the National Symposium, Descriptive Geometry, Technical Graphics and Design, (GTD' 03), Braşov, pp: 353-358.

Petrescu, F. and R. Petrescu, 2005a. The cam design for a better efficiency. Proceedings of the International Conference on Engineering Graphics and Design, (EGD' 05), Bucharest, pp: 245-248.

Petrescu, F. and R. Petrescu, 2005b. Contributions at the dynamics of cams. Proceedings of the 9th IFToMM International Symposium on Theory of Machines and Mechanisms, (TMM' 05), Bucharest, Romania, pp: 123-128.

Petrescu, F. and R. Petrescu, 2005c. Determining the dynamic efficiency of cams. Proceedings of the 9th IFToMM International Symposium on Theory of Machines and Mechanisms, (TMM’ 05), Bucharest, Romania, pp: 129-134.

Petrescu, F. and R. Petrescu, 2005d. An original internal combustion engine. Proceedings of the 9th IFToMM International Symposium on Theory of Machines and Mechanisms, (TMM’ 05), Bucharest, Romania, pp: 135-140.

Petrescu, F. and R. Petrescu, 2005e. Determining the mechanical efficiency of Otto engine’s mechanism. Proceedings of the 9th IFToMM International Symposium on Theory of Machines and Mechanisms, (TMM 05), Bucharest, Romania, pp: 141-146.

Petrescu, F.I. and R.V. Petrescu, 2011a. Mechanical Systems, Serial and Parallel (Romanian). 1st Edn., LULU Publisher, London, UK, pp: 124.

Petrescu, F.I.T. and RV. Petrescu, 2011b. Trenuri Planetare. 1st Edn., Createspace Independent Pub., ISBN-13: 978-1468030419, pp: 104.

Petrescu, F.I. and R.V. Petrescu, 2012a. Kinematics of the planar quadrilateral mechanism. ENGEVISTA, 14: 345-348.

Petrescu, F.I. and R.V. Petrescu, 2012b. Mecatronica-Sisteme Seriale si Paralele. 1st Edn., Create Space Publisher, USA, pp: 128.

Petrescu, F.I. and R.V. Petrescu, 2013a. Cinematics of the 3R dyad. ENGEVISTA, 15: 118-124.

Petrescu, F.I.T. and R.V. Petrescu, 2013b. Forces and efficiency of cams. Int. Rev. Mech. Eng., 7: 507-511.

Petrescu, F.I.T. and R.V. Petrescu, 2013c. Cams with high efficiency. Int. Rev. Mech. Eng., 7: 599-606.

Petrescu, F.I.T. and R.V. Petrescu, 2013d. An algorithm for setting the dynamic parameters of the classic distribution mechanism. Int. Rev. Modell. Simulat., 6: 1637-1641.

Petrescu, F.I.T. and R.V. Petrescu, 2013e. Dynamic synthesis of the rotary cam and translated tappet with roll. Int. Rev. Modell. Simulat., 6: 600-607.

Petrescu, F.I.T. and R.V. Petrescu, 2014a. Parallel moving mechanical systems. Independent J. Manage. Product., 5: 564-580.

Petrescu, F.I.T. and R.V. Petrescu, 2014b. Cam gears dynamics in the classic distribution. Independent J. Manage. Product., 5: 166-185.

Petrescu, F.I.T. and R.V. Petrescu, 2014c. High-efficiency gears synthesis by avoid the interferences. Independent J. Manage. Product., 5: 275-298.

Petrescu, F.I.T. and R.V. Petrescu, 2014d. Gear design. J. ENGEVISTA, 16: 313-328.

Petrescu, F.I.T. and R.V. Petrescu, 2014e. Kinetostatic of the 3R dyad (or 2R module). J. ENGEVISTA, 16: 314-321.

Petrescu, F.I.T. and R.V. Petrescu, 2014f. Balancing Otto engines. Int. Rev. Mech. Eng., 8: 473-480.

Petrescu, F.I.T. and R.V. Petrescu, 2014g. Machine equations to the classical distribution. Int. Rev. Mech. Eng., 8: 309-316.

Petrescu, F.I.T. and R.V. Petrescu, 2014h. Forces of internal combustion heat engines. Int. Rev. Modell. Simulat., 7: 206-212.

Petrescu, F.I.T. and R.V. Petrescu, 2014i. Determination of the yield of internal combustion thermal engines. Int. Rev. Mech. Eng., 8: 62-67.

Petrescu, F.I.T. and R.V. Petrescu, 2015a. Forces at the main mechanism of a railbound forging manipulator. Independent J. Manage. Product., 6: 904-921.

Petrescu, F.I.T. and R.V. Petrescu, 2015b. Kinematics at the main mechanism of a railbound forging manipulator. Independent J. Manage. Product., 6: 711-729.

Petrescu, F.I.T. and R.V. Petrescu, 2015c. Machine motion equations. Independent J. Manage. Product., 6: 773-802.

Petrescu F.I.T. and R.V. Petrescu, 2015d. Presenting a railbound forging manipulator. Applied Mech. Mater., 762: 219-224.

Petrescu, F.I.T. and R.V. Petrescu, 2015e. About the anthropomorphic robots. J. ENGEVISTA, 17: 1-15.

Petrescu, F.I. and R.V. Petrescu, 2016a. Parallel moving mechanical systems kinematics. ENGEVISTA, 18: 455-491.

Petrescu, F.I. and R.V. Petrescu, 2016b. Direct and inverse kinematics to the anthropomorphic robots. ENGEVISTA, 18: 109-124.

Petrescu, F.I. and R.V. Petrescu, 2016c. Dynamic cinematic to a structure 2R. Revista Geintec-Gestao Inovacao E Tecnol., 6: 3143-3154.

Petrescu, FIT. and R.V. Petrescu, 2016d. An Otto engine dynamic model. Independent J. Manage. Product., 7: 038-048.

Petrescu, N. and FIT. Petrescu, 2018a. Elementary Structure of Matter Can Be Studied with New Quantum Computers, SSRN.

Petrescu, N. and FIT. Petrescu, 2018b. Geometric-Cinematic Synthesis of Planetary Mechanisms, SSRN.

Petrescu, R.V., R. Aversa, A. Apicella and F.I. Petrescu, 2016. Future medicine services robotics. Am. J. Eng. Applied Sci., 9: 1062-1087. DOI: 10.3844/ajeassp.2016.1062.1087

Petrescu, F.I., B. Grecu, A. Comanescu and R.V. Petrescu, 2009. Some mechanical design elements. Proceeding of the International Conference on Computational Mechanics and Virtual Engineering, (MVE’ 09), Braşov, pp: 520-525.

Petrescu, F.I.T., 2011. Teoria Mecanismelor si a Masinilor: Curs Si Aplicatii. 1st Edn., CreateSpace Independent Publishing Platform. ISBN-10: 1468015826. pp: 432.

Petrescu, F.I.T., 2015a. Geometrical synthesis of the distribution mechanisms. Am. J. Eng. Applied Sci., 8: 63-81. DOI: 10.3844/ajeassp.2015.63.81

Petrescu, F.I.T., 2015b. Machine motion equations at the internal combustion heat engines. Am. J. Eng. Applied Sci., 8: 127-137. DOI: 10.3844/ajeassp.2015.127.137

Petrescu, FIT., 2015c. Machine Motion Equations at the Internal Combustion Heat Engines, SSRN.

Petrescu, FIT., 2018a. Dynamic Models of Rigid Memory Mechanisms, SSRN.

Petrescu, FIT., 2018b. About the Triton Structure, SSRN.

Petrescu, F.I.T., A. Apicella, A. Raffaella, R.V. Petrescu and J.K. Calautit *et al*., 2016. Something about the mechanical moment of Inertia. Am. J. Applied Sci., 13: 1085-1090. DOI: 10.3844/ajassp.2016.1085.1090

Petrescu, R.V., R. Aversa, B. Akash, R. Bucinell and J. Corchado *et al*., 2017a. Yield at thermal engines internal combustion. Am. J. Eng. Applied Sci., 10: 243-251. DOI: 10.3844/ajeassp.2017.243.251

Petrescu, R.V., R. Aversa, B. Akash, B. Ronald and J. Corchado *et al*., 2017b. Velocities and accelerations at the 3R mechatronic systems. Am. J. Eng. Applied Sci., 10: 252-263. DOI: 10.3844/ajeassp.2017.252.263

Petrescu, R.V., R. Aversa, B. Akash, R. Bucinell and J. Corchado *et al*., 2017c. Anthropomorphic solid structures n-r kinematics. Am. J. Eng. Applied Sci., 10: 279-291. DOI: 10.3844/ajeassp.2017.279.291

Petrescu, R.V., R. Aversa, B. Akash, R. Bucinell and J. Corchado *et al*., 2017d. Inverse kinematics at the anthropomorphic robots, by a trigonometric method. Am. J. Eng. Applied Sci., 10: 394-411. DOI: 10.3844/ajeassp.2017.394.411

Petrescu, R.V., R. Aversa, B. Akash, R. Bucinell and J. Corchado *et al*., 2017e. Forces at internal combustion engines. Am. J. Eng. Applied Sci., 10: 382-393. DOI: 10.3844/ajeassp.2017.382.393

Petrescu, R.V., R. Aversa, B. Akash, R. Bucinell and J. Corchado *et al*., 2017f. Gears-Part I. Am. J. Eng. Applied Sci., 10: 457-472. DOI: 10.3844/ajeassp.2017.457.472

Petrescu, R.V., R. Aversa, B. Akash, R. Bucinell and J. Corchado *et al*., 2017g. Gears-part II. Am. J. Eng. Applied Sci., 10: 473-483. DOI: 10.3844/ajeassp.2017.473.483

Petrescu, R.V., R. Aversa, B. Akash, R. Bucinell and J. Corchado *et al*., 2017h. Cam-gears forces, velocities, powers and efficiency. Am. J. Eng. Applied Sci., 10: 491-505. DOI: 10.3844/ajeassp.2017.491.505

Petrescu, R.V., R. Aversa, B. Akash, R. Bucinell and J. Corchado *et al*., 2017i. Dynamics of mechanisms with cams illustrated in the classical distribution. Am. J. Eng. Applied Sci., 10: 551-567. DOI: 10.3844/ajeassp.2017.551.567

Petrescu, R.V., R. Aversa, B. Akash, R. Bucinell and J. Corchado *et al*., 2017j. Testing by non-destructive control. Am. J. Eng. Applied Sci., 10: 568-583. DOI: 10.3844/ajeassp.2017.568.583

Petrescu, R.V., R. Aversa, A. Apicella and F.I.T. Petrescu, 2017k. Transportation engineering. Am. J. Eng. Applied Sci., 10: 685-702. DOI: 10.3844/ajeassp.2017.685.702

Petrescu, R.V., R. Aversa, S. Kozaitis, A. Apicella and F.I.T. Petrescu, 2017l. The quality of transport and environmental protection, part I. Am. J. Eng. Applied Sci., 10: 738-755. DOI: 10.3844/ajeassp.2017.738.755

Petrescu, R.V., R. Aversa, B. Akash, R. Bucinell and J. Corchado *et al*., 2017m. Modern propulsions for aerospace-a review. J. Aircraft Spacecraft Technol., 1: 1-8. DOI: 10.3844/jastsp.2017.1.8

Petrescu, R.V., R. Aversa, B. Akash, R. Bucinell and J. Corchado *et al*., 2017n. Modern propulsions for aerospace-part II. J. Aircraft Spacecraft Technol., 1: 9-17. DOI: 10.3844/jastsp.2017.9.17

Petrescu, R.V., R. Aversa, B. Akash, R. Bucinell and J. Corchado *et al*., 2017o. History of aviation-a short review. J. Aircraft Spacecraft Technol., 1: 30-49. DOI: 10.3844/jastsp.2017.30.49

Petrescu, R.V., R. Aversa, B. Akash, R. Bucinell and J. Corchado *et al*., 2017p. Lockheed martin-a short review. J. Aircraft Spacecraft Technol., 1: 50-68. DOI: 10.3844/jastsp.2017.50.68

Petrescu, R.V., R. Aversa, B. Akash, J. Corchado and F. Berto *et al*., 2017q. Our universe. J. Aircraft Spacecraft Technol., 1: 69-79. DOI: 10.3844/jastsp.2017.69.79

Petrescu, R.V., R. Aversa, B. Akash, J. Corchado and *et al*., 2017r. What is a UFO? J. Aircraft Spacecraft Technol., 1: 80-90. DOI: 10.3844/jastsp.2017.80.90

Petrescu, R.V., R. Aversa, B. Akash, J. Corchado and F. Berto *et al*., 2017s. About bell helicopter FCX-001 concept aircraft-a short review. J. Aircraft Spacecraft Technol., 1: 91-96. DOI: 10.3844/jastsp.2017.91.96

Petrescu, R.V., R. Aversa, B. Akash, J. Corchado and F. Berto *et al*., 2017t. Home at airbus. J. Aircraft Spacecraft Technol., 1: 97-118. DOI: 10.3844/jastsp.2017.97.118

Petrescu, R.V., R. Aversa, B. Akash, J. Corchado and F. Berto *et al*., 2017u. Airlander. J. Aircraft Spacecraft Technol., 1: 119-148. DOI: 10.3844/jastsp.2017.119.148

Petrescu, R.V., R. Aversa, B. Akash, J. Corchado and F. Berto *et al*., 2017v. When boeing is dreaming-a review. J. Aircraft Spacecraft Technol., 1: 149-161. DOI: 10.3844/jastsp.2017.149.161

Petrescu, R.V., R. Aversa, B. Akash, J. Corchado and F. Berto *et al*., 2017w. About Northrop Grumman. J. Aircraft Spacecraft Technol., 1: 162-185. DOI: 10.3844/jastsp.2017.162.185

Petrescu, R.V., R. Aversa, B. Akash, J. Corchado and F. Berto *et al*., 2017x. Some special aircraft. J. Aircraft Spacecraft Technol., 1: 186-203. DOI: 10.3844/jastsp.2017.186.203

Petrescu, R.V., R. Aversa, B. Akash, J. Corchado and F. Berto *et al*., 2017y. About helicopters. J. Aircraft Spacecraft Technol., 1: 204-223. DOI: 10.3844/jastsp.2017.204.223

Petrescu, R.V., R. Aversa, B. Akash, F. Berto and A. Apicella *et al*., 2017z. The modern flight. J. Aircraft Spacecraft Technol., 1: 224-233. DOI: 10.3844/jastsp.2017.224.233

Petrescu, R.V., R. Aversa, B. Akash, F. Berto and A. Apicella *et al*., 2017aa. Sustainable energy for aerospace vessels. J. Aircraft Spacecraft Technol., 1: 234-240. DOI: 10.3844/jastsp.2017.234.240

Petrescu, R.V., R. Aversa, B. Akash, F. Berto and A. Apicella *et al*., 2017ab. Unmanned helicopters. J. Aircraft Spacecraft Technol., 1: 241-248. DOI: 10.3844/jastsp.2017.241.248

Petrescu, R.V., R. Aversa, B. Akash, F. Berto and A. Apicella *et al*., 2017ac. Project HARP. J. Aircraft Spacecraft Technol., 1: 249-257. DOI: 10.3844/jastsp.2017.249.257

Petrescu, R.V., R. Aversa, B. Akash, F. Berto and A. Apicella *et al*., 2017ad. Presentation of Romanian engineers who contributed to the development of global aeronautics-part I. J. Aircraft Spacecraft Technol., 1: 258-271. DOI: 10.3844/jastsp.2017.258.271

Petrescu, R.V., R. Aversa, B. Akash, F. Berto and A. Apicella *et al*., 2017ae. A first-class ticket to the planet mars, please. J. Aircraft Spacecraft Technol., 1: 272-281. DOI: 10.3844/jastsp.2017.272.281

Petrescu, RVV. *et al*., 2017af. Some Basic Reactions in Nuclear Fusion, SSRN.

Petrescu, RVV. *et al*., 2017ag. Deuteron Dimensions, SSRN.

Petrescu, RVV. *et al*., 2017 ah. Some Proposed Solutions to Achieve Nuclear Fusion, SSRN.

Petrescu, RVV. *et al*., 2017 ai. Dynamic Elements at MP3R, SSRN.

Petrescu, FIT. *et al*., 2017 aj. Nikola Tesla, SSRN, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3092615

Petrescu, R.V., R. Aversa, A. Apicella, M.M. Mirsayar and S. Kozaitis *et al*., 2018a. NASA started a propeller set on board voyager 1 after 37 years of break. Am. J. Eng. Applied Sci., 11: 66-77. DOI: 10.3844/ajeassp.2018.66.77

Petrescu, R.V., R. Aversa, A. Apicella, M.M. Mirsayar and S. Kozaitis *et al*., 2018b. There is life on mars? Am. J. Eng. Applied Sci., 11: 78-91. DOI: 10.3844/ajeassp.2018.78.91

Petrescu, R.V., R. Aversa, A. Apicella and F.I.T. Petrescu, 2018c. Friendly environmental transport. Am. J. Eng. Applied Sci., 11: 154-165. DOI: 10.3844/ajeassp.2018.154.165

Petrescu, R.V., R. Aversa, B. Akash, T.M. Abu-Lebdeh and A. Apicella *et al*., 2018d. Buses running on gas. Am. J. Eng. Applied Sci., 11: 186-201. DOI: 10.3844/ajeassp.2018.186.201

Petrescu, R.V., R. Aversa, B. Akash, T.M. Abu-Lebdeh and A. Apicella *et al*., 2018e. Some aspects of the structure of planar mechanisms. Am. J. Eng. Applied Sci., 11: 245-259. DOI: 10.3844/ajeassp.2018.245.259

Petrescu, RV., R. Aversa, T.M. Abu-Lebdeh, A. Apicella and F.I.T. Petrescu, 2018f. The forces of a simple carrier manipulator. Am. J. Eng. Applied Sci., 11: 260-272. DOI: 10.3844/ajeassp.2018.260.272

Petrescu, RV., R. Aversa, T.M. Abu-Lebdeh, A. Apicella and F.I.T. Petrescu, 2018g. The dynamics of the otto engine. Am. J. Eng. Applied Sci., 11: 273-287. DOI: 10.3844/ajeassp.2018.273.287

Petrescu, RV., R. Aversa, T.M. Abu-Lebdeh, A. Apicella and F.I.T. Petrescu, 2018h. NASA satellites help us to quickly detect forest fires. Am. J. Eng. Applied Sci., 11: 288-296. DOI: 10.3844/ajeassp.2018.288.296

Petrescu, RV., R. Aversa, T.M. Abu-Lebdeh, A. Apicella and F.I.T. Petrescu, 2018i. Kinematics of a mechanism with a triad. Am. J. Eng. Applied Sci., 11: 297-308. DOI: 10.3844/ajeassp.2018.297.308

Petrescu, R.V., R. Aversa, A. Apicella and F.I.T. Petrescu, 2018j. Romanian engineering "on the wings of the wind". J. Aircraft Spacecraft Technol., 2: 1-18. DOI: 10.3844/jastsp.2018.1.18

Petrescu, R.V., R. Aversa, A. Apicella and F.I.T. Petrescu, 2018k. NASA Data used to discover eighth planet circling distant star. J. Aircraft Spacecraft Technol., 2: 19-30. DOI: 10.3844/jastsp.2018.19.30

Petrescu, R.V., R. Aversa, A. Apicella and F.I.T. Petrescu, 2018l. NASA has found the most distant black hole. J. Aircraft Spacecraft Technol., 2: 31-39. DOI: 10.3844/jastsp.2018.31.39

Petrescu, R.V., R. Aversa, A. Apicella and F.I.T. Petrescu, 2018m. Nasa selects concepts for a new mission to titan, the moon of saturn. J. Aircraft Spacecraft Technol., 2: 40-52. DOI: 10.3844/jastsp.2018.40.52

Petrescu, R.V., R. Aversa, A. Apicella and F.I.T. Petrescu, 2018n. NASA sees first in 2018 the direct proof of ozone hole recovery. J. Aircraft Spacecraft Technol., 2: 53-64. DOI: 10.3844/jastsp.2018.53.64

Petrescu, RVV. *et al*., 2018o. Dynamic Synthesis of a Dual-Clutch Automatic Gearboxes, SSRN.

Petrescu, RVV. *et al*., 2018p. Dynamic Synthesis of a Classic, Manual Gearbox, SSRN.

Petrescu, RVV. *et al*., 2018q. The Dynamics of the Otto Engine, SSRN.

Petrescu, RVV. *et al*., 2018r. Kinematics of a Mechanism with a Triad, SSRN.

Petrescu, FIT. *et al*., 2018s. Presentation of a Mechanism with a Maltese Cross (Geneva Driver), SSRN.

Petrescu, FIT. *et al*., 2018t. An Analytical Method for Determining Forces within a Triad, SSRN.

Petrescu, FIT. *et al*., 2018u. Study of an Oscillating Sliding Mechanism, SSRN.

Petrescu, FIT. *et al*., 2018v. Presentation of the Mechanism in the Cross, SSRN.

Pisello, A.L., G. Pignatta, C. Piselli, V.L. Castaldo and F. Cotana, 2016. Investigating the dynamic thermal behavior of building envelope in summer conditions by means of in-field continuous monitoring. Am. J. Eng. Applied Sci., 9: 505-519. DOI: 10.3844/ajeassp.2016.505.519

Pourmahmoud, N., 2008. Rarefied gas flow modeling inside rotating circular cylinder. Am. J. Eng. Applied Sci., 1: 62-65. DOI: 10.3844/ajeassp.2008.62.65

Pravettoni, M., C.S.P. Lòpez and R.P. Kenny, 2016. Impact of the edges of a backside diffusive reflector on the external quantum efficiency of luminescent solar concentrators: Experimental and computational approach. Am. J. Eng. Applied Sci., 9: 53-63. DOI: 10.3844/ajeassp.2016.53.63

Qutbodin, K., 2010. Merging autopilot/flight control and navigation-flight management systems. Am. J. Eng. Applied Sci., 3: 629-630. DOI: 10.3844/ajeassp.2010.629.630

Rajbhandari, S., Z. Ghassemlooy and M. Angelova, 2011. The performance of a dual header pulse interval modulation in the presence of artificial light interferences in an indoor optical wireless communications channel with wavelet denoising. Am. J. Eng. Applied Sci., 4: 513-519. DOI: 10.3844/ajeassp.2011.513.519

Rajput, R.S., S. Pandey and S. Bhadauria, 2016. Correlation of biodiversity of algal genera with special reference to the waste water effluents from industries. Am. J. Eng. Applied Sci., 9: 1127-1133. DOI: 10.3844/ajeassp.2016.1127.1133

Rajupillai, K., S. Palaniammal and K. Bommuraju, 2015. Computational intelligence and application of frame theory in communication systems. Am. J. Eng. Applied Sci., 8: 633-637. DOI: 10.3844/ajeassp.2015.633.637

Raptis, K.G., G.A. Papadopoulos, T.N. Costopoulos and A.D. Tsolakis, 2011. Experimental study of load sharing in roller-bearing contact by caustics and photoelasticity. Am. J. Eng. Applied Sci., 4: 294-300. DOI: 10.3844/ajeassp.2011.294.300

Rama, G., D. Marinkovic and M. Zehn, 2016. Efficient co-rotational 3-node shell element. Am. J. Eng. Applied Sci., 9: 420-431. DOI: 10.3844/ajeassp.2016.420.431

Rea, P. and E. Ottaviano, 2016. Analysis and mechanical design solutions for sit-to-stand assisting devices. Am. J. Eng. Applied Sci., 9: 1134-1143. DOI: 10.3844/ajeassp.2016.1134.1143

Rhode-Barbarigos, L., V. Charpentier, S. Adriaenssens and O. Baverel, 2015. Dialectic form finding of structurally integrated adaptive structures. Am. J. Eng. Applied Sci., 8: 443-454. DOI: 10.3844/ajeassp.2015.443.454

Riccio, A., U. Caruso, A. Raimondo and A. Sellitto, 2016a. Robustness of XFEM method for the simulation of cracks propagation in fracture mechanics problems. Am. J. Eng. Applied Sci., 9: 599-610. DOI: 10.3844/ajeassp.2016.599.610

Riccio, A., R. Cristiano and S. Saputo, 2016b. A brief introduction to the bird strike numerical simulation. Am. J. Eng. Applied Sci., 9: 946-950. DOI: 10.3844/ajeassp.2016.946.950

Rich, F. and M.A. Badar, 2016. Statistical analysis of auto dilution Vs manual dilution process in inductively coupled plasma spectrometer tests. Am. J. Eng. Applied Sci., 9: 611-624. DOI: 10.3844/ajeassp.2016.611.624

Rohit, K. and S. Dixit, 2016. Mechanical properties of waste Biaxially Oriented Polypropylene metallized films (BOPP), LLDPE: LDPE films with sisal fibres. Am. J. Eng. Applied Sci., 9: 913-920. DOI: 10.3844/ajeassp.2016.913.920

Rulkov, N.F., A.M. Hunt, P.N. Rulkov and A.G. Maksimov, 2016. Quantization of map-based neuronal model for embedded simulations of neurobiological networks in real-time. Am. J. Eng. Applied Sci., 9: 973-984. DOI: 10.3844/ajeassp.2016.973.984

Saikia, A. and N. Karak, 2016. Castor oil based epoxy/clay nanocomposite for advanced applications. Am. J. Eng. Applied Sci., 9: 31-40. DOI: 10.3844/ajeassp.2016.31.40

Sallami, A., N. Zanzouri and M. Ksouri, 2016. Robust diagnosis of a DC motor by bond graph approach. Am. J. Eng. Applied Sci., 9: 432-438. DOI: 10.3844/ajeassp.2016.432.438

Samantaray, K.S., S. Sahoo and C.S. Rout, 2016. Hydrothermal synthesis of CuWO4-reduced graphene oxide hybrids and supercapacitor application. Am. J. Eng. Applied Sci., 9: 584-590. DOI: 10.3844/ajeassp.2016.584.590

Santos, F.A. and C. Bedon, 2016. Preliminary experimental and finite-element numerical assessment of the structural performance of SMA-reinforced GFRP systems. Am. J. Eng. Applied Sci., 9: 692-701. DOI: 10.3844/ajeassp.2016.692.701

Semin, A.R. Ismail and R.A. Bakar, 2009a. Combustion temperature effect of diesel engine convert to compressed natural gas engine. Am. J. Eng. Applied Sci., 2: 212-216. DOI: 10.3844/ajeassp.2009.212.216

Semin, A.R. Ismail and R.A. Bakar, 2009b. Effect of diesel engine converted to sequential port injection compressed natural gas engine on the cylinder pressure Vs crank angle in variation engine speeds. Am. J. Eng. Applied Sci., 2: 154-159. DOI: 10.3844/ajeassp.2009.154.159

Semin S., A.R. Ismail and R.A. Bakar, 2009c. Diesel engine convert to port injection CNG engine using gaseous injector nozzle multi holes geometries improvement: A review. Am. J. Eng. Applied Sci., 2: 268-278. DOI: 10.3844/ajeassp.2009.268.278

Semin and R.A. Bakar, 2008. A technical review of compressed natural gas as an alternative fuel for internal combustion engines. Am. J. Eng. Applied Sci., 1: 302-311. DOI: 10.3844/ajeassp.2008.302.311

Sepúlveda, J.A.M., 2016. Outlook of municipal solid waste in Bogota (Colombia). Am. J. Eng. Applied Sci., 9: 477-483. DOI: 10.3844/ajeassp.2016.477.483

Serebrennikov, A., D. Serebrennikov and Z. Hakimov, 2016. Polyethylene pipeline bending stresses at an installation. Am. J. Eng. Applied Sci., 9: 350-355. DOI: 10.3844/ajeassp.2016.350.355

Shanmugam, K., 2016. Flow dynamic behavior of fish oil/silver nitrate solution in mini-channel, effect of alkane addition on flow pattern and interfacial tension. Am. J. Eng. Applied Sci., 9: 236-250. DOI: 10.3844/ajeassp.2016.236.250

Shruti, 2016. Comparison in cover media under stegnography: Digital media by hide and seek approach. Am. J. Eng. Applied Sci., 9: 297-302. DOI: 10.3844/ajeassp.2016.297.302

Stavridou, N., E. Efthymiou and C.C. Baniotopoulos, 2015a. Welded connections of wind turbine towers under fatigue loading: Finite element analysis and comparative study. Am. J. Eng. Applied Sci., 8: 489-503. DOI: 10.3844/ajeassp.2015.489.503

Stavridou, N., E. Efthymiou and C.C. Baniotopoulos, 2015b. Verification of anchoring in foundations of wind turbine towers. Am. J. Eng. Applied Sci., 8: 717-729. DOI: 10.3844/ajeassp.2015.717.729

Suarez, L., T.M. Abu-Lebdeh, M. Picornell and S.A. Hamoush, 2016. Investigating the role of fly ash and silica fume in the cement hydration process. Am. J. Eng. Applied Sci., 9: 134-145. DOI: 10.3844/ajeassp.2016.134.145

Syahrullah, O.I. and N. Sinaga, 2016. Optimization and prediction of motorcycle injection system performance with feed-forward back-propagation method Artificial Neural Network (ANN). Am. J. Eng. Applied Sci., 9: 222-235. DOI: 10.3844/ajeassp.2016.222.235

Sylvester, O., I. Bibobra and O.N. Ogbon, 2015a. Well test and PTA for reservoir characterization of key properties. Am. J. Eng. Applied Sci., 8: 638-647. DOI: 10.3844/ajeassp.2015.638.647

Sylvester, O., I. Bibobra and O. Augustina, 2015b. Report on the evaluation of Ugua J2 and J3 reservoir performance. Am. J. Eng. Applied Sci., 8: 678-688. DOI: 10.3844/ajeassp.2015.678.688

Taher, S.A., R. Hematti and M. Nemati, 2008. Comparison of different control strategies in GA-based optimized UPFC controller in electric power systems. Am. J. Eng. Applied Sci., 1: 45-52. DOI: 10.3844/ajeassp.2008.45.52

Takeuchi, T., Y. Kinouchi, R. Matsui and T. Ogawa, 2015. Optimal arrangement of energy-dissipating members for seismic retrofitting of truss structures. Am. J. Eng. Applied Sci., 8: 455-464. DOI: 10.3844/ajeassp.2015.455.464

Theansuwan, W. and K. Triratanasirichai, 2011. The biodiesel production from roast Thai sausage oil by transesterification reaction. Am. J. Eng. Applied Sci., 4: 130-132. DOI: 10.3844/ajeassp.2011.130.132

Thongwan, T., A. Kangrang and S. Homwuttiwong, 2011. An estimation of rainfall using fuzzy set-genetic algorithms model. Am. J. Eng. Applied Sci., 4: 77-81. DOI: 10.3844/ajeassp.2011.77.81

Tourab, W., A. Babouri and M. Nemamcha, 2011. Experimental study of electromagnetic environment in the vicinity of high voltage lines. Am. J. Eng. Applied Sci., 4: 209-213. DOI: 10.3844/ajeassp.2011.209.213

Tsolakis, A.D. and K.G. Raptis, 2011. Comparison of maximum gear-tooth operating bending stresses derived from niemann's analytical procedure and the finite element method. Am. J. Eng. Applied Sci., 4: 350-354. DOI: 10.3844/ajeassp.2011.350.354

Vernardos, S.M. and C.J. Gantes, 2015. Cross-section optimization of sandwich-type cylindrical wind turbine towers. Am. J. Eng. Applied Sci., 8: 471-480. DOI: 10.3844/ajeassp.2015.471.480

Wang, L., T. Liu, Y. Zhang and X. Yuan, 2016. A methodology for continuous evaluation of cloud resiliency. Am. J. Eng. Applied Sci., 9: 264-273. DOI: 10.3844/ajeassp.2016.264.273

Wang, L., G. Wang and C.A. Alexander, 2015. Confluences among big data, finite element analysis and high-performance computing. Am. J. Eng. Applied Sci., 8: 767-774. DOI: 10.3844/ajeassp.2015.767.774

Wang, J. and Y. Yagi, 2016. Fragment-based visual tracking with multiple representations. Am. J. Eng. Applied Sci., 9: 187-194. DOI: 10.3844/ajeassp.2016.187.194

Waters, C., S. Ajinola and M. Salih, 2016. Dissolution sintering technique to create porous copper with sodium chloride using polyvinyl alcohol solution through powder metallurgy. Am. J. Eng. Applied Sci. 9: 155-165. DOI: 10.3844/ajeassp.2016.155.165

Wessels, L. and H. Raad, 2016. Recent advances in point of care diagnostic tools: A review. Am. J. Eng. Applied Sci., 9: 1088-1095. DOI: 10.3844/ajeassp.2016.1088.1095

Yang, M.F. and Y. Lin, 2015. Process is unreliable and quantity discounts supply chain integration inventory model. Am. J. Eng. Applied Sci., 8: 602-610. DOI: 10.3844/ajeassp.2015.602.610

Yeargin, R., R. Ramey and C. Waters, 2016. Porosity analysis in porous brass using dual approaches. Am. J. Eng. Applied Sci., 9: 91-97. DOI: 10.3844/ajeassp.2016.91.97

You, M., X. Huang, M. Lin, Q. Tong and X. Li *et al*., 2016. Preparation of $LiCoMnO_4$ assisted by hydrothermal approach and its electrochemical performance. Am. J. Eng. Applied Sci., 9: 396-405. DOI: 10.3844/ajeassp.2016.396.405

Zeferino, R.S., J.A.R. Ramón, E. de Anda Reyes, R.S. González and U. Pal, 2016. Large scale synthesis of ZnO nanostructures of different morphologies through solvent-free mechanochemical synthesis and their application in photocatalytic dye degradation. Am. J. Eng. Applied Sci., 9: 41-52. DOI: 10.3844/ajeassp.2016.41.52

Zhao, B., 2013. Identification of multi-cracks in the gate rotor shaft based on the wavelet finite element method. Am. J. Eng. Applied Sci., 6: 309-319. DOI: 10.3844/ajeassp.2013.309.319

Zheng, H. and S. Li, 2016. Fast and robust maximum power point tracking for solar photovoltaic systems. Am. J. Eng. Applied Sci., 9: 755-769. DOI: 10.3844/ajeassp.2016.755.769

Zotos, I.S. and T.N. Costopoulos, 2009. On the use of rolling element bearings' models in Precision maintenance. Am. J. Eng. Applied Sci., 2: 344-352. DOI: 10.3844/ajeassp.2009.344.352

Zulkifli, R., K. Sopian, S. Abdullah and M.S. Takriff, 2008. Effect of pulsating circular hot air jet frequencies on local and average nusselt number. Am. J. Eng. Applied Sci., 1: 57-61. DOI: 10.3844/ajeassp.2008.57.61

Zulkifli, R., K. Sopian, S. Abdullah and M.S. Takriff, 2009. Experimental study of flow structures of circular pulsating air jet. Am. J. Eng. Applied Sci., 2: 171-175. DOI: 10.3844/ajeassp.2009.171.175

Zurfi, A. and J. Zhang, 2016a. Model identification and wall-plug efficiency measurement of white LED modules. Am. J. Eng. Applied Sci., 9: 412-419. DOI: 10.3844/ajeassp.2016.412.419

Zurfi, A. and J. Zhang, 2016b. Exploitation of battery energy storage in load frequency control-a literature survey. Am. J. Eng. Applied Sci., 9: 1173-1188. DOI: 10.3844/ajeassp.2016.1173.1188

Source of Figures:

Petrescu and Petrescu, 2014 f, 2014 g, 2014 h, 2014 i.

Nomenclature

F_m: is the motor force;

F_τ: is the tangential force, which produces the rotation of the element;

F_n: is the normal force, which is transmitted along the connecting rod;

F_R: is the radial force, who press on the cylinder barrel in which guides the piston;

F_u: The utile force, F_u, moves the piston (when the mechanism is in compressor system) and rotates the crank (when the mechanism is in motor system);

F_c: is the force of compression and presses on the crankpin (B) and then on the crank and bearing (A);

$\varphi_1 = \varphi$: is the position angle of the crank;

$\varphi_{2'} = \psi$: is the position angle of the rod (element 2), if the rod is considered from the point C;

$\varphi_2 = \theta$: is the position angle of the rod, if the rod is considered from the point B;

$\omega_1 = \omega$: the angular rotation speed of the crank (the motor shaft);

l_1: is the length of the crank;

l_2: is the length of the rod (the connecting rod);

λ: is the raport between l_1 and l_2;

η_i^c : is the instantly efficiency of the mechanism in the compressor system;

η^c: is the mechanical yield of the mechanism in the compressor system;

η_i^m : is the instantly efficiency of the mechanism in the motor system;

η^m: is the mechanical yield of the mechanism in the motor system